THE IRON TRADE REVIEW

VOLUME XXXII. CLEVELAND, O. JUNE 29, 1899. CHICAGO, ILL. NUMBER 26

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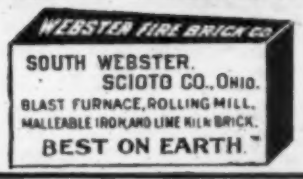

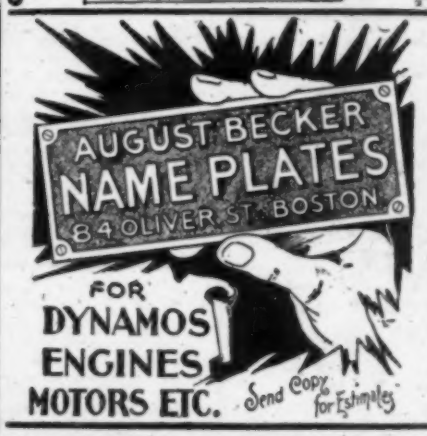

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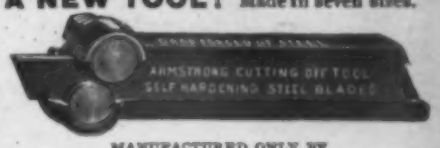

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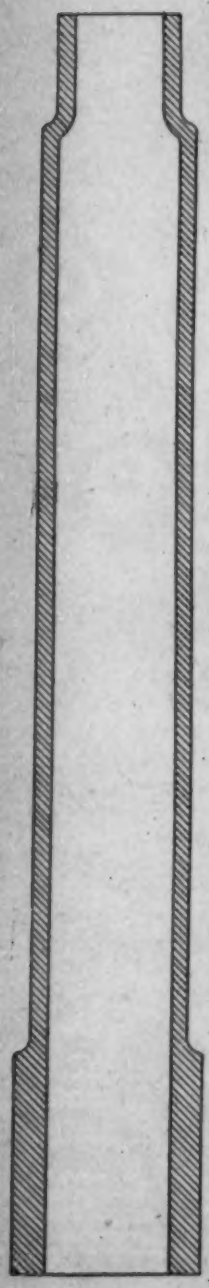

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THE IRON TRADE REVIEW

VOLUME XXXII. CLEVELAND, O. JUNE 29, 1899. CHICAGO, ILL. NUMBER 26

THE WEEK IN IRON CIRCLES.

THE MARKET AT LARGE.

The iron trade has come to the midway point in this remarkable year, but the expectations entertained three months ago that from this vantage ground the future could be more clearly read than at that time are not all realized. Without really wishing for the end of present conditions, in so far as they stand for consumption exceeding production, the trade has been looking for several months for signs of the end, as though they might appear any week. Three months farther advance into the year has established something, however—that the unprecedented demand for iron and steel is not due to transient causes. That the unpreparedness of producing agencies to meet it, which has been the foremost fact in the year's record thus far, will be remedied in a measure in the second half seems well assured now; yet there is no indication that the trade is waiting for the equilibrium to be restored. Buying still goes on as though the only question of moment was that of getting needed supplies. Indications of over-selling begin to appear, and a feature that will be emphasized in the third quarter of the year is the friction growing out of unfilled promises of delivery. In the case of the Besemer furnaces of the Central West it is apparent that maximum records must be made in the balance of the year to give steel works the metal they have contracted for; and indications are that to keep converters fully occupied at the current rate of production more pig iron must be had than is provided for in present contracts. The uncertain factor is the contribution of furnaces yet to be put in blast. Thus far calculations and results have differed widely, in respect to the tonnage available from starting up old plants. It is taking months, instead of weeks, to get equipment and supplies for many of these plants, and where any considerable amount of work must be done to put them in shape, the structural works or boiler or machine shop and foundry prove to be as badly behind as are the rolling mills. Ore and fuel production cannot be put abreast of such consumption of iron as is now going on, much short of a half year. It is noteworthy that the June bookings by furnaces producing foundry iron have been much beyond expectations. Prices have advanced about $2 a ton in the month, but this has not stopped business, and the month has put very considerable contracts on furnace books for delivery in 1900. On Southern iron prices are now on a basis of $14 Birmingham for No. 2 foundry and $12.50 for gray forge. Furnaces North and South still vary considerably in prices. Some ask current figures for deliveries in the first half of 1900; others have established a basis about $1 a ton below going prices. Steel works may have a chance to catch their breath in the race with finishing mills next week, as the latter for the most part make repairs at the turn of their wage year. The tin plate shut-down resulting from the wage disagreement is not expected to be prolonged, but it may amount to a week, and that means some release of the pressure upon steel plants for bars. The situation of the finishing mills does not improve; that is, with most of them more business is going on their books than goes off in shipments. Structural mills that were expected to show the effects of restricted buying, are getting farther and farther behind. The negotiations of the Russian Government for 120,000 tons of rails for the Trans-Siberian railroad represent only a portion of the probable Russian investment in American iron and steel products in the next few years. Contracts for ordnance are also pending and Eastern manufacturers are expecting to receive a large share, a $20,000,000 expenditure being talked of in this country alone. Probably the largest bar iron transaction in the history of the trade is that just concluded between the Republic Iron & Steel Co. and the American Car & Foundry Co. The deal involves the transfer of a large tonnage of scrap from the car company.

PITTSBURG.

OFFICE OF *The Iron Trade Review and Industrial World.*
705 PUBLICATION BUILDING, June 28.

The general iron and steel market shows less change during the past week than usual, the principal feature being a further tightening in Bessemer pig, which is scarcer and 50 to 75 cents a ton higher. There is every prospect that the high range of prices for all iron and steel products will be maintained through the year. Some business is being done in finished lines for the early months in next year, and those who are selling in this way naturally cover for their raw materials, which is adding strength to the market. Those who purchase raw material in such a connection need not be careful as to the exact price to be paid as the transaction involves considerable profit, and on that account too much should not be deduced from such sales. The volume of transactions in the week under review has been smaller than the average of some weeks past, but at this season of the year very little is expected, and the market has held up very well at a time when values generally suffer a slight decline. There will be very little interruption to production in July, and no more than is absolutely necessary to make repairs and to let the men have some vacation where they insist on it.

PIG IRON.—Since the meeting of Bessemer furnacemen last Wednesday, there has been sold between 10,000 and 15,000 tons of Bessemer pig, at $19 valley, and there are now but a few thousand tons to sell for delivery before Jan. 1. There is some talk of prices as high as $20, but small lots can be secured at $19 or a slight advance above it, while for any considerable tonnage it would be difficult to place an order at all. The steel makers generally must come in for some round lots of iron before the end of the year, though with the concentration of ownership this is less the case than in

any previous year, and the demand for Bessemer iron for the balance of the year is likely to be overrated. Converting capacity has not been increased in the last two years in the same ratio as blast furnace capacity, and were it not for the turning of furnaces formerly on Bessemer into gray forge and foundry, there would now be more Bessemer pig capacity than converting capacity, and pig iron would not be so high in proportion to steel. As it is, there will be a call for every ton produced, and a high range of prices is likely to extend into next year. We note a sale of a moderate lot of Bessemer pig for the first quarter of next year at $20, but this should not be taken as a criterion of prices for such deliveries, as the purchase was only made to cover for some finished product which a customer was anxious to have. In gray forge the market has stiffened, and we note sales of moderate lots at Pittsburg at $17, and at the same price in the valleys. In foundry irons the market has been without any large tonnage movement, as both demand and supply have dwindled to a very low level, and we quote foundry irons unchanged from last week. Prices follow:

Bessemer, valley furnace	$19.00 to 19.25
Bessemer, Pittsburg	19 75 to 20.00
No. 1 Foundry	17.50 to 18.00
No. 2 Foundry	17.25 to 17.75
No. 3 Foundry	16.75 to 17.25
Gray Forge, valley furnace	17 60 to 17.25
Gray Forge, Pittsburg	17.00 to 17.5

STEEL.—The steel billet market is very quiet, and prices are about as last noted, without any transactions of importance. The steel mills seem to be catching up somewhat on deliveries, but have very little to sell for the balance of the year. Probably more than half the supplies will come from those who re-sell steel. We quote $33 to $34, Pittsburg, for ordinarily small lots.

FERRO-MANGANESE.—There is no change to be noted in ferro. The supply is limited, and the minimum is $85, for large lots.

RAILS AND TRACK MATERIAL.—The Russian government is negotiating in this country for a large tonnage of rails for the Trans Siberian railway, deliveries covering an extended period. The report that an order had been placed with the local mill cannot be confirmed. A considerable tonnage of rails for this railway has been made at Sparrow's Point. We quote standard sections at $28 to $30, Pittsburg. In track material there is a very good demand. We quote prices in some lines higher, as follows: Spikes, 2.20c to 2.30c; track bolts, 2.65c to 2.75c; splice bars, 1.75c to 1.90c; links and pins, 2.15c to 2.25c.

BARS.—No steel bars can be secured below 2c, and as high as 2.25c is secured for small lots. In iron bars the price is almost as high, 1.95c to 2.25c.

STRUCTURAL MATERIAL.—There is a very fair running demand for structural material, and prices remain as follows: Beams and channels, 3 to 15 inches, 1.75c; 18 to 24 inches, 1.85c; tees, 1.80c; zees, 1.80c; and angles, 1.75c universal mill plate, 2.35c.

PLATES.—The plate market is active, and some moderately prompt deliveries are being secured, at a decided premium over later ones. We note sales of tank at 2.50c and 2.55c for early delivery, while for later delivery all lines of plates are up from $1 to $2 a ton. We quote as follows: Tank, 2.40c; shell, 2.50c; flange, 2.65c; fire box, 3½c to 4c.

PIPES AND TUBES.—The market is very strong. Every effort is being made for the new company to assume formal charge of the business July 1, but it is not certain that this can be done. The pipe makers have for some time been pretty close together, and the trade is now handled in such a manner that there will be a minimum of charge in methods when the different mills are absorbed. We quote prices as follows: Merchant pipe, base discount, 50 per cent and additional discounts two 10's for less than carloads and two 10's and 5 for carloads, with free delivery on the latter within the prescribed territory; lap weld casing, 40 for screw and socket joint and 35 for inserted joint, with 5 per cent additional on carload orders; boiler tubes, 1¼ to 1½-inch, 40 per cent; 1¾ to 2½-inch, 50 for iron and 55 for steel; 2¾ to 6-inch, 55 for iron and 57½ for steel; extra 5 per cent to dealers.

SHEETS.—The sheet mills are showing considerably more courage than they have when prices have been depressed, and are quite independent in quoting. It is customary now to scale down inquiries for a given tonnage, and refuse to quote except on a smaller amount. There is greater strength proportionately in the heavier gauges, 16 gauge and anything heavier commanding a comparatively higher price than the lighter gauges. We note sales of No. 16 at 2.80c. For 28 common we quote the market unchanged at 2.95c to 3c. In galvanized the market is about the same, 70 and 10 with 15-cent freight allowance, being the minimum quoted for desirable business. It is expected that the spelter market will regain all of the recently lost strength, and that galvanized is expected to go higher.

SPELTER.—Spelter has gone off further since last report, and has sold at 5.25c, St. Louis, and 5 40c, Pittsburg. It is generally predicted that the weakness is only temporary, and that when the ore men put into effect their scheme of sending ore abroad the smelters will be forced to pay higher prices and the metal will then go up

OLD MATERIAL.—The market is about as last reported, all lines of scrap being scarce. We note sales of open-hearth scrap at $22. We quote as follows: New melting stock, $15; old steel rails, long lengths, $15 to $15.50; cut, $14 50 to $15; old iron rails, $20 to $21; wrought iron scrap, $15 to $16; cast borings, $9 to $9.50, net, Pittsburg; busheling scrap, $12.50 to $13, net; car wheels (nominal), $14 to $15, gross; cast scrap, $12.50 to $13, gross; charcoal scrap, $13, gross; wrought turnings, $9 to $9.50 net, Pittsburg.

COKE.—The coke market is very strong, and nothing below $2.25 can be done on strictly Connellsville furnace coke, with crushed and foundry strong at $2.15 to dealers and $2.30 to consumers.

CHICAGO.

Office of The Iron Trade Review and Industrial World.
1522 MONADNOCK BLOCK, June 27.

Iron and steel products advance in this market with little if any demand. The trading the past week has been of a rather commonplace character, yet values are higher. Consumers are not troubling the producers to a greater extent than is absolutely necessary, and since the recent added strength they are as a rule, buying only for their immediate needs. Trade is therefore largely of a car load order. But this small business is enough to influence prices. The higher quotations apply chiefly to this early delivery trade, for future needs are very largely covered by contracts taken at a lower range. Pig iron is decidedly stronger. Old steel rails are higher and merchant steel of all kinds has advanced from $2 to $3 per ton. Where quotations have not advanced they are firm at former figures. Weakness is nowhere discernible. Mills and furnaces are sold ahead so far into the future that quiet must necessarily be of considerable duration before it unfavorably affects values. Generally speaking, the mills are sold up through the summer months and some producers are not coveting any additional trade for the year.

PIG IRON.—Consumers of pig iron, who bought for their supposed requirements months ago, for deliveries extending beyond the present month and who underestimated their needs, are not now covering farther into the future, but are merely buying from hand to mouth. This leaves uncovered a large probable need, of sufficient volume perhaps, to influence values when it appears. Local irons have again advanced about $1 per ton and Southern products are up 50 cents. Sellers are now engaged chiefly in trying to fill demands for current needs, and to that end are searching outside markets for possible material to ship into this field. Last Monday one seller in this city shipped 100 tons of pig iron from Texas to one of his needy customers in Indiana. But the Lone Star State has little to offer and from the East there are apparently no large stocks to draw on for requirements here. The situation seems very strong. The Calumet Furnace according to present expectations, will be in blast late this week. It is well sold ahead. Revised quotations are as follows:

Lake Sup. Charcoal	$20 50	$23 00	
Local Coke Fdy. No. 1	19 00 @	19 50	
Local Coke Fdy. No. 2	18 50 @	19 00	
Local Coke Fdy. No. 3	18 00 @	18 50	
Local Scotch Fdy. No. 1	19 00 @	19 50	
Local Scotch Fdy. No. 2	18 50 @	19 00	
Local Scotch Fdy. No. 3	18 00 @	18 50	
Southern Coke No. 1	18 50 @	19 00	
Southern Coke No. 2	18 00 @	18 50	
Southern Coke No. 3	$17 50 @	$18 00	
Southern No. 1 Soft	18 50 @	19 00	
Southern No. 2 Soft	18 00 @	18 50	
Southern Silveries	18 00 @	18 25	
Jackson Co. Silveries	22 50 @	23 00	
Ohio Strong Softeners	20 00 @	21 00	
Alabama Car Wheel	19 50 @	20 00	
Malleable Bessemer	20 00 @	20 50	
Coke Bessemer	20 00 @	20 50	

BARS.—Bar mills generally hope to run continuously with the minimum shut-down next week, extending possibly only over

the fourth of July. There is a steady demand for bars and a fair tonnage has been placed in the aggregate. Sales have acquired a volume sufficent to keep mills running through the summer months. Prices are firm at previous quotations, about 2c for steel and 1.80 to 1.90 for iron.

STRUCTURAL MATERIAL.—It is reported that mills, instead of gaining upon their order books, keep slipping behind and that promised deliveries are now farther ahead than ever. Business in this market has been of fair proportions during the past week, but without special note. Quotations are: Beams, 15 inches and under, 1.90c to 2c; 18 inches and over, 2c to 2.10c; angles under 3 inches and over 6 inches, 2c to 2.10c; 3 inches to 6 inches, 1.90c to 2c; sheared plates, 2.65c to 2.70c; universal plates, 2.65c; tees, 1.95c to 2c; zees, 1.95c to 2c. Small lots from store are quoted ¼c to ½c higher.

PLATES.—With only the supplies that are in middle hands to satisfy the trade in this territory, stocks are inadequate. Consequently values keep climbing. There is said to be a somewhat less demand for heavy plates, but for the lighter gauges no diminution in the demand can be discovered. Quotations are as follows: Tank steel from stock is quoted 2.80c to 3.20c. Mill shipments, Chicago delivery, are quoted as follows: Tank steel, 2.75c; shell, 2.85c; flange, 2.95c; marine, 2.95c; fire box, 3c to 5c, according to brand.

MERCHANT PIPE.—Trade is quiet from the enforced retirement of producers from this market. The advance in steel pipe has been so greatly in excess of some other products that unless material shows further decided advance, some people connected with the trade do not look for an early rise n the quotations of pipe. But buying is not a matter of choice by the buyer. Mills are not quoting, except in exceptional cases. Quotations from mill are 50, two 10's and 5.

SHEETS.—There have been moderate sales of sheets at former prices. Galvanized iron is quoted 70 and 10 from mill and 70 from store. Black sheets are 3 to 3.10 for No. 27.

MERCHANT STEEL.—An additional advance of from $2 to $3 per ton does not seem to have disturbed the buying propensities of consumers, who in large number are closing for their needs during the next six months or longer. Revised quotations are as follows: Smooth finish tire steel, 2.45c to 2.50c; smooth finish machinery steel, 2.70c to 2.75c; spring steel, 3.20c to 3.30c; tool steel, 6c to 7.50c; special 10c and upwards.

BILLETS AND RODS.—Little is doing in these departments and quotations are unchanged at about $32 for Bessemer billets and $37 to $40 for open-hearth billets. Rods are $42.

RAILS AND TRACK SUPPLIES.—Interest is aroused here by the reported large sales of rails by the Eastern markets for foreign shipments. It can not be learned that there have been any large inquiries from abroad in this market, but some months ago local makers were obliged to decline to bid on inquiries from abroad for the reason that they could not make the deliveries that were wanted. With small transactions standard rails are unchanged at $30 to $32; light rails, $32 to $37. Splice bars are 1.70c to 1.75c; spikes, 2.25c to 2.35c; track bolts, 2.85c to 3.25c.

OLD MATERIAL.—Old steel rails are again higher this week both for re-melting and for re-rolling. Otherwise the market is steady with fair sales at old quotations. Prices are as follows:

Old iron rails, gross,	$17 75@$18 00	Axles, net	$18 00@$19 00
Old steel rails, long, gr.	15 00@ 15 25	Cast borings, net	6 00@ 6 50
Old steel rails, mixed	14 25@ 14 50	Wrought turnings, net	7 50@ 8 00
Old wheels, gross	15 00@ 15 50	Axle turnings, net	8 25@ 8 75
Railroad forge, net	15 50@ 16 50	Mixed steel, gross	9 50@10 00
Dealer's forge, net	12 00@ 12 50	Stove plates, net	7 00@ 7 50
No. 1 mill, net	8 75@ 9 25	Heavy melting steel, gr.	11 00@12 00
Heavy cast, net	11 00@ 11 50	Old iron splice b., net.	17 00@17 50
Malleable cast, net	8 00@ 8 50		

WIRE AND WIRE NAILS.—Continued activity prevails in the wire mills, both wire and nails selling in fairly large quantities. Wire nails are quoted at $2.60, f. o. b. Chicago, in car lots, and $2.70 less than car lots. On wire current quotations are as follows: Plain annealed wire, $2.45; painted barb wire at $2.70; galvanized barb wire, $3.20.

CLEVELAND.

OFFICE OF *The Iron Trade Review and Industrial World.* 27 VINCENT ST., June 28.

There is no doubt in the ore trade that a new record for a month's shipment has been made in June, and the official figures are awaited with unusual interest. Maximum records are being made in the size of cargoes. Nominally in the case of head of the lake ports and actually in the case of Marquette and Escanaba, an advance of 5 cents in the ore rate has been made the past week. Wild charters are reported at 75 cents from Marquette and 70 cents from Escanaba, with a steady business done from Lake Michigan on triangular trips—boats ore laden from the head of Lake Superior going to South Chicago, then light to Escanaba where ore is taken for Lake Erie port, and the next destination in turn being Duluth, and alternating The grain movement is well sustained on a basis of 2½ from the head of the lake, equivalent to $1 on ore, while contract boats are carrying 60 cent ore. This is the best summer rate paid in years and vesselmen are not slow to take advantage of it. There have been no wild ore charters from Duluth, Ashland and Two Harbors for more than a week. Activity in Republic Iron Co stock has been the feature of iron mining stocks the past week, options at 20 having been asked by Chicago parties, interpreted by some who have marketed their holdings on the advance of the week as preliminary to the purchase of the property by an ore-consuming interest.

PIG IRON.—The meeting of furnace owners in the Bessemer association, held in Cleveland last week, resulted in no official declaration concerning prices, because no inquiries for iron were before the association and for the further reason that the furnaces have scarcely any iron for sale now for 1899 delivery. Ideas of association furnacemen range from $18 to $20 as the basis of the next contract taken, but it is a fact that there has been no formally fixed price above $17, which was named on a transaction about three weeks ago. Sales at higher figures are said to have been of outside iron. The indications are that some are oversold; others have tried to keep a margin of safety and make sure of deliveries. With no association price current we quote Bessemer at $18 to $19, valley furnace. A sale of non-association iron is reported at the equivalent of $19 at valley furnace. The demand for foundry iron is only moderate with some sellers; in other cases a good business has been done the past week. Southern irons have been sold to the extent of several thousand tons in the past few days. Inquiry is coming more freely for iron for delivery in 1900 and sales are reported covering the first six months. Prices vary. In some instances the current market price is being maintained; in other cases 1900 deliveries are put at $1 less. We note sales of No. 2 foundry ranging from $17.25 to $19, valley furnace, the more general figure for this year's delivery being $18 The variation is unusual. Sales of gray forge are reported at $16.50, valley furnace, and $17 is the quotation in other quarters. For the first time in years an addition is to be made to the blast furnaces of Cleveland. It is announced that the American Steel & Wire Co. will build a 500 ton stack as an addition to its central group of Cleveland Rolling Mill Co. furnaces. The basic open-hearth plant the company is to build at Newburgh will consist of four 50-ton furnaces, which will call for a considerable part of the output of one furnace. Cleveland pig iron prices follow:

Bessemer	$19 65	Valley Scotch No. 1	$18 50@19 50
No. 1 Strong Foundry	18 50@19 50	Valley Scotch No. 2	17 75@18 75
No. 2 Strong Foundry	17 75@18 75	Gray Forge, valley	16 50@17 00
No. 3 Foundry	16 75@17 25	Lake Superior Charcoal.	19 00@20 00

FINISHED MATERIAL.—There is no relief in sight for the mills, and the shut-downs in the early days of July will not improve the situation. Demand from all sources continues and there is no such thing as catching up; with most mills the tendency is the other way. Buyers are complaining of defaults on deliveries, and building operations under way and projected are delayed by inability to procure material. Structural mills are running steadily behind on deliveries. In a few instances where small lots of steel were ordered and could not be obtained wood has been substituted in building. Architectural foundries have been fully as remiss, moreover, as the structural mills. In bar iron new contracts are not being discussed as yet, in this territory. Mills are far behind. In view of the large advance in steel, a higher price in iron is expected soon. At present 1.70c at valley mill is quoted, with 5c additional for cutting; less than car loads 1.85c is asked. The Cleveland price from store was advanced to 2c this week. Steel bars are quoted 2c to 2.25c, Pittsburg, and some mills are now unable to make deliveries on ordinary specifications short of Jan. 1. Activity in sheets continues. We quote 3.20c out of Cleveland stock for No. 7 black and 70

and 70 and 5 per cent on galvanized. Little local business is done in plates; 2.50c is the nominal quotation for tank.

OLD MATERIAL.—There is no change in the prices, except that for old iron rails, of which very few are obtainable, about $1 a ton higher has been paid. The Republic Iron & Steel Co. has been again a considerable buyer in the past week. We quote: Old iron rails, $20 to $21, valley mill; old steel rails, $15 to $15.50; old car wheels, $16, Cleveland—gross tons. No. 1 railroad wrought scrap is $16.50; wrought turnings, $10; cast borings, $9; busheling scrap, $12.50, valley; machinery cast scrap, $12.50 to $13, Cleveland—net tons.

WIRE AND WIRE NAILS.—The Pittsburg quotations remain as follows on carload lots to jobbers: Plain annealed wire, $2.20; painted barb wire, $2.45; galvanized, $2.95; wire nails, $2.35. Freight to Cleveland is added for deliveries in this district.

CINCINNATI.

June 27.

It is astonishing how the demand continues without any cessation. When June opened there was a very general feeling that so much iron had been bought that the month would probably be quiet. The producers certainly felt that this would be the case. In fact there was quite a general feeling on the part of iron masters and selling agents when June opened that it would be a quiet month, and they were glad to think that at last they would have an opportunity to settle down, calmly survey the situation and find out, to use the street vernacular, where they were at. All these expectations proved fallacious. June has been a busier month than any month that preceded it and the total tonnage of orders placed has been surprisingly large. Now that the month is nearly over there is no let-up in inquiry. As far as can be seen now July promises to keep on pretty much after the June fashion. During the week that has just closed there has been a heavy demand for foundry iron for shipment during the first six months of next year and a large amount of metal for this delivery has been sold. The standard quotations now at Birmingham for 2 and 3 foundry are $14 and $13. Gray forge is $12.50. No iron is obtainable at anything less than these prices and possibly in some instances where there have been special features more money has been obtained. We quote for cash f. o. b. Cincinnati: Southern coke, No. 1 foundry, $17.75 to 18.00; No. 2, $17.25 to $17.50; No. 3, $16.25 to $16.50; No. 4 and gray forge, $15.75 to $16; mottled, $15.75 to $16; No. 1 soft, $17.75 to $18; No. 2 soft, $17.25 to $17.50; Lake Superior coke, No. 1, $19 to $19.50; No. 2, $18.50 to $19; Hanging Rock charcoal No. 1, $21 to $22; Jackson Co. silvery No. 1, $22 to $23; Standard Georgia car wheel, $18.25 to $19; Lake Superior charcoal, $21.50 to $22.

PHILADELPHIA.

June 27.

The market has been comparatively quiet the past week, with prices higher. It takes little buying to continue the advance. There is no sign of a change in conditions. With the turn of the month there will be a shut-down in the mills, but this will be made unusually brief. Manufacturers begrudge every day's idleness with such a pressure as is now on them for material. There are indications that consumers of foundry iron are doing a larger business than their purchases have provided for, and they are still buying for 1899 delivery, though the movement has quieted temporarily. Sellers are not sorry for the relief. Those in the trade who are looking for data on which to base a judgment of the second half of the year find little. In spite of the new furnaces coming into blast there is the fact of consumption steadily exceeding the production to be reckoned with. Under these conditions nothing can stop the steady appreciation of values, though it may proceed more slowly now. While the effort to find a fair basis for new buying is going on, $18 50 is about the figure for No. 2X foundry iron. Some are disposed to ask more, in view of the prices quoted in the Central West. Mill iron is scarce and quotations range from $17 to $17.50, this being likewise a low basis compared with Western quotations. Owing to the failure of some furnaces to make deliveries, on account of accidents, basic iron is much wanted and buyers find difficulty in supplying themselves. In the steel billet market there is inquiry, but the material cannot be had. The nominal quotation is $34. Some considerable purchases are pending. The situation regarding finished material is not likely to be helped but will rather grow worse, as July will be a short month in production, owing to hot weather and repair shut-downs. It is evident that orders are not being placed to the extent usual at this time in the year—that is, long time contracts are not being made; if such contracts came upon the market now a further advance would be inevitable. Prices are very firm at the quotations of a week ago, with sheets about $2 a ton higher. We quote steel bars at 2.15c; refined bar iron, 2c to 2.10c; beams and channels up to 15 inches, 1.85c; black sheets, 3.50c for No. 27; tank plate 2.65c.

IRON AND STEEL CONSOLIDATIONS.

The expected action was taken at the meeting of the American Steel & Wire Co. directors at New York, Friday, June 23. The regular quarterly dividend of 1¾ per cent on the preferred was declared but none on the common sotck. Charges and countercharges have been burdening financial columns, in connection with this matter, for the past fortnight. The common stock had sold well up on intimations, taken as official, that a dividend on the common would be declared. It is evident that the company's expenditures in betterments and in the acquisiton of properties led to the decision concerning the common dividend. The following statement was given out after the meeting: "It was resolved that, in view of the difference of opinion entertained as to the legal power of the company to pay any dividend on the common stock of this company at the present time, and of the pending litigation in New Jersey concerning the Federal Steel Co., the motion for a dividend on the common stock be tabled. It was also resolved to apply, at the earliest practicable moment, for regular listing of the stock of the company upon the New York exchange, and to furnish the necessary statement required by the rules of the exchange."

The American Steel & Wire Co., which has been letting contracts recently for four 50-ton basic open-hearth furnaces to be built at once at the plant of the Cleveland Rolling Mill Co., Newburgh, has also prepared plans for two 500-ton blast furnaces, one to be erected at the Edith plant, Pittsburg, and the other at the Central Furnace plant in Cleveland. The latter will represent the first blast furnace erection in Cleveland in 18 years, Central Furnaces having been built in 1881-2.

The National Tube Co., it is understood, is floated without any considerable amount of outside subscriptions, the stock being almost entirely in the hands of the constituent interests. The new organization is expected to take hold July 1.

Notice of discontinuance of the suit of Walter R. Kern, to prevent the payment of the recently declared dividend on the common stock of the Federal Steel Co., was filed in the court of chancery at Trenton, N. J., June 26.

President Guthrie, of the American Steel Hoop Co., makes the following statement, in view of the current report of a dividend on the common stock of his company: "The company was oragnized on April 17, and has been doing business for only about two months. A meeting will be held about July 1 to declare our first dividend on the preferred stock, but the dividends on the common stock will not be considered at present. The hoop company is doing a splendid business and making a great deal of money, and at the proper time the question of a dividend on the common stock will be considered."

President Gary, of the Federal Steel Co., makes the following statement concerning its earnings and prospects for 1899: "The constituent companies are doing all the business that is possible at fair prices. All the mills are full, running night and day. The demand greatly exceeds the supply. The Minnesota Iron Co., will mine this year not less than 3,200,000 tons of iron ore. The Duluth & Iron Range Railroad will carry not less than 4,000,000 tons of ore in addition to its general business. The Illinois Steel and the Lorain Steel Co.s together will manufacture upwards of 2,000,000 tons of finished products. The business of the E., J. & E. Railroad is increasing a little month by month. The constituent companies have already declared dividends in favor of Federal Steel for nearly $4,000,000, and have sufficient surplus to pay more if required. We have declared two dividends of $798,915 each on the preferred stock and set aside two more of the same amount for the next two quarterly dividends, and one on common of $581,053, over which the trouble is being made, a total of $3,776,713. The constituent companies have a considerable surplus besides already earned, and that during the first half of the year when prices were considerably lower than they will be the second half. For most lines of business the companies have orders booked which will take more than a year to fill."

THE PITTSBURG DISTRICT.

Dealers in old material make up an important branch of the iron and steel trade in so important a steel making center as Pittsburg, where large quantities of melting steel and other material calculated for open-hearth steel manufacture are handled in the course of a year. Foundry wants in the Pittsburg district are also no inconsiderable factor. A well-known representative of this trade is Joseph Dreifus, whose headquarters are 203-4-5 Monongahela Bank Bldg, Wood st., and Sixth ave. All lines of iron and steel scrap are handled through these offices.

The Pennsylvania Car Wheel Co., of Allegheny, will extend its plant and equipment at an expenditure of $100,000. Contracts have been placed. The improvements will increase the capacity of the works from 300 to 630 wheels per day. Most of the output of the plant is taken by the Pressed Steel Car Co.

The Totten & Hogg Iron & Steel Foundry Co., Pittsburg, has received through Herman Hirsch, its agent at Stockholm, Sweden, an order for one of its regular 24-inch roll lathes. The company has been figuring on considerable work of this nature in the past few months.

Jones & Laughlins, Ltd., expect to start the 72-inch plate mill in the Moorhead-McCleane plant, recently purchased, early in July. The other plate mill in the plant was started recently.

Ground has been broken at Etna, Pa., for the additions to be made at the plant of Spang, Chalfant & Co., in connection with the reorganization of the concern.

The American Steel Hoop Co has moved into its new offices in the First National Bank Building, Wood and Fifth aves., Pittsburg. The offices were entirely refitted. Since its organization, the general offices of the company have been in the Painter offices on Water st.

Parties who were interested in the Pittsburg Horse Shoe Co., which sold its partially completed plant at Glassport, Pa., to the American Steel & Wire Co., are organizing the Pittsburg Steel Hoop Co. The machinery on the ground at Glassport is being removed to the horse shoe plant in the Schoenberger plant of the American Steel & Wire Co., and the Pittsburg Steel Hoop Co. will acquire the holdings at Glassport of the Pittsburg Horse Shoe Co., and will proceed to erect on the land a plant for the manufacture of hoops and cotton ties. The principal parties interested are W. C. Reitz, Edwin Bindley, Willis F. McCook, B. J. Jarrett and Emil Winter.

The National Tube Works Co. has just completed the shipment to New York of a large consignment of 28-inch lap weld pipe to be used in the Rand mines, South Africa. The company received the contract in competiton with plants in Germany, England and the United States.

Chess Bros. of Pittsburg, have leased the Anchor Nail and Tack Works, on the South Side, to Neal Bros., who have begun repairing and expect to have the plant in operation at once. There are 24 puddling furnaces. Neal Brothers intend to use the plant for rolling muck iron, and will later on utilize the finishing mills.

The Clearfield Fire Brick Co., through its agent, John Richardson, of Pittsburg, has contracted to furnish the National Steel Co. with the fire brick to be used in the construction of eight hot blast stoves to be erected at Youngstown and New Castle.

The Pennsylvania Malleable Iron Co., Pittsburg, capital $10,000, has been incorporated at Harrisburg by G. S. White, L. W. Young, W. J. McKee, Pittsburg; C. V. McGlauchlin, Allegheny; G. E. Macklin, Swickley. A larger capital will be announced later. It is stated that the plant will be located at McKee's Rocks.

A new fitting up shop, 250x1,100 feet, is to be erected at the Keystone Bridge Works. The plant will be equipped with electrical machinery, and will require about 400 additional men.

The contract for two blooming mills, tables, shears, manipulators, etc., for the improvement of the Schoenberger and Washburn & Moen plants of the American Steel & Wire Co., has been placed with the Frank-Kneeland Machine Co., of Pittsburg. This company is also in receipt of an order for 8-inch, 12-inch and 20-inch merchant mills, with all shears, roll lathes, etc., to equip them, from a Russian company. It is just completing its extensive contract for steel works machinery for the Alabama Steel & Ship Building Co., and has well under way the machinery for a twenty-two mill sheet mill plant at Granite City, Ill.

At Pittsburg a court order was made last week confirming the sale of the American Vault, Safe & Lock Co.'s works at Elizabeth, Allegheny Co., to M. M. Garland, for $11,300. The plant will be put in operation at once.

Jones & Laughlins, Ltd., have been operating one of the plate mills in the Moorhead-McCleane plant for some time, with an output of something over 50 tons a day. It is expected that the other mill will be put in operation early in July, and when all is in good running order the combined capacity will be fully 200 tons a day.

The West Newton Stone & Brick Co. has been formed to manufacture red brick, fire brick, building brick and special hollow shapes for bottom cast ingots in open-hearth steel plants. The new company, in which E. A. Humphreys is the principal stockholder, has taken over the brick plant and deposits of Mr. Humphreys at West Newton. The plant has been making red brick for some time. Associated with the new company as general manager is B. F. Johnston, for some years connected with the Manown Mfg. Co., making these special steel shapes, the manufacture of which is to be added at West Newton. The machinery for the purpose is expected next week, and brick will probably be turned out early in July. Mr. Johnston's headquarters will be at the branch office, 502 Publication Building, Pittsburg.

Moorhead, Brother & Co., Sharpsburg, Pa., are having trouble with their employes. Some time ago the company posted notices that it would pay its employes whatever wages were decided upon for Western Pennsylvania. Since this notice, some puddlers formed a lodge, and the company has now posted notices calling attention to its record in the matter of fair treatment and the payment of good wages, and warns employes that their organization will mean discharge. It is understood that the company has always paid good wages, but does not desire a repetition of the petty annoyances which existed prior to the strike in its works in 1891, since which time the plant has been non-union. The works produce skelp, bridge, tank and bar iron and steel.

Southern Exports of Pig Iron.

The statement of shipments of iron from Alabama and Tennessee in the first five months of 1899 show a total of 605,919 tons, an increase of 85,821 tons over the corresponding five months in 1898. From the Birmingham district alone the shipments were 359,089 tons, an increase of 36,101 tons over 1898. The shipments of cast iron pipe for the first five months of 1899 were 67,882 tons, an increase over the first five months of 1898 of 14 093 tons. The exports of Southern pig iron in the period named were 83,989 tons, an increase of 28,704 tons over 1898. The export shipments of pipe in the same period were 7,785 tons.

In an interview with a representative of the *Commercial* at New York, J. A. Green, of Matthew Addy & Co., made the statement that foreign countries are actually begging for supplies of American iron. He said that letters from abroad relative to orders for iron were so numerous that his firm had adopted a stereotyped reply. "Iron exports will undoubtedly show a falling off from last year. But this fact reflects the increased prosperity of the industry rather than indicating that American iron manufacturers are losing their prestige abroad. The truth of the matter is that the domestic consumption of iron has reached such enormous proportions that exporting in record-breaking quantities is out of the question. Of course this enormous domestic consumption cannot continue forever. When the mills and furnaces are able to accommodate foreign buyers American iron exports will reach a record-breaking figure."

I. W. Bollinger, Monadnock Building, Chicago, has been appointed Western manager of the newly formed Atlantic Tube Co., of Pittsburg. He will have charge of all territory west of Pennsylvania. The company's plant for the production of seamless drawn tubes for boiler tubes, automobiles, bicycles, pumps, etc., will be started in September.

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AND
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JUNE 29, 1899.

A 100 PER CENT ADVANCE IN PRICES.

Quite a different condition from the actual is indicated by displayed articles in the newspapers, announcing that pig iron has now reached a figure twice as high as that ruling when the present advance started. It is a fact that as against $9.50 at valley furnace at the low point last year $19 was paid the past week; and on foundry iron likewise the advance has amounted in some instances to 100 per cent. But the fact still needs emphasizing that an insignificant tonnage relatively is sold at the high prices. It would be interesting to set down the bookings of pig iron as they appear on producers' sales books and strike the average. It would be found, no doubt, judging from some data at hand that may be regarded as typical, that instead of an advance of 100 per cent, as indicated by the low point and high point sales, furnacemen have realized but little more than 33⅓ per cent above the low level prices of 1898. The upward movement is almost entirely confined to this year, as a comparison of low prices in 1898 and those on Jan. 1, 1899, will show. Moreover, this 33⅓ per cent advance, which means an average of something over $12 for Northern No. 2 foundry iron, will not have been realized until the shipment has been completed of the iron now booked. This will take in most cases six months more, or up to Jan. 1, 1900. It is well known that $10 and $11 pig iron is still being shipped from the Bessemer-producing furnaces of the valleys; and the last of the $9.50 foundry iron has not yet gone from the furnace. The early advances made producers quite willing to sell freely, and at that stage in the movement buyers were more keen to cover than when prices had gone $1 nad $2 farther and the first serious talk was heard about reaching the "danger line." Those early danger lines are very tame now.

We must go back to the latter part of 1887 or the early part of 1888 to come to prices approximately on to-day's basis. In the last year of prosperity preceding the panic the level was distinctly below to-day's. As indicating just what the basis was in June, 1892, and showing how little advance from the low point of last year had taken place before Jan. 1, 1899, the table below is interesting:

	June 30, 1891.	Low Point, 1898.	Jan. 1, 1899.	June 28, 1899.
Local No. 2 Foundry, Chicago	$15.00	$10.50	$11.00	$18.50
Gray Forge Cincinnati	11.75	8.25	9.00	15.75
Tank Plates, Chicago	45.00	22.00	26.00	53.00
Billets Pittsburg	23.00	14.63	16.65	33.00
Beams Pittsburg	38.00	23.50	26.00	35.00
Bessemer Pig, Pittsburg	14.00	9.75	10.90	19.65
Bar Iron, Cleveland	30.00	19.00	20.00	35.00

Such a level of prices as indicated in the last column above is well calculated to make large buyers hesitate. The ultimate consumer has not felt the effect of it yet. It has scarcely reached the farmer, for example. What he will do about it is a question sundry important interests, including implement manufacturers, would like to have answered. In the absence of light they are prudently committing themselves only fractionally on contracts for 1900. Enough is known, at all events, to indicate that the present movement will not culminate much short of 1900. Meantime if mills would seriously attempt to catch up with their orders and so far as possible postpone the discussion of contracts for 1900 the transition to the lower basis which every one in the trade believes to be only a matter of months, will be accomplished with much less danger than now threatens. To-day's market has been made on too slender a tonnage to be seriously regarded as a basis for a year of business that does not begin for six months.

THE *Railroad Gazette* has made a preliminary canvass of the new railroad construction in the United States in the first six months of 1899 and finds that, notwithstanding the increased activities in the railroad field this year, the total mileage of actual building completed proves somewhat disappointing. The total shown is 1,181.45 miles, which will be increased somewhat by later returns. This is an increase of about 90 miles over the preliminary figures of last year; but from construction actually known to be under way operations are much more extensive than last year's, and it is quite certain that the year's total will show a very considerable gain over the nearly 3,300 miles of 1898. The *Gazette* notes, for example, the Chicago & Northwestern road, which has 247 miles of new line under way, but only four miles were included in the statement for the first half of the year. The second six months is the building portion of the year, in railroad work, and last year showed about two miles of new construction for every one completed before June 30.

THE communication from Wm. Garrett, which appears on another page, discusses more at length the suggestion referred to in these columns last week, for the utilization of steel rails in the manufacture of wire nails. As advancing prices and limited supply of steel have set in operation nearly every puddling furnace in the country, after the puddler had been notified time and again that his occupation was fast going and nearly gone, similarly the conditions in the billet and rod markets prompt

a proposal which would bring in vogue the methods of an early day in the wire and wire nail industries. Mr. Garrett's connection with wire manufacture almost from its beginning gives competence to his opinion; and there are indications that the suggestion may have a practical outcome in this year of unexpected developments.

DISAGREEMENT ON THE TIN PLATE SCALE.

After a conference lasting from Tuesday to Saturday of last week the representatives of the American Tin Plate Co. and the Amalgamated Association failed to come to an agreement on the wage scale for the year beginning July 1. The workers' representatives were bound by the decision of the Detroit convention, and were not in position to consider any concessions from the scale there formulated, which, as has already been stated, embodied very radical advances from the present scale. It is understood that there was perfect good feeling at the conference, and had the workers been free to negotiate in the matter it is probable that a compromise could have been arranged that would have embodied very substantial advances for the workers.

One of the principal points urged by the representatives of the Tin Plate Co., was the fact that the scale presented was not the scale originally adopted by the Detroit convention, but one which went considerably beyond it in the matter of advances. It was stated that the company was perfectly willing to pay a moderate advance.

As the matter now stands the tin plate mills controlled by the Amalgamated Association will cease work at midnight Friday, twelve hours sooner than if the scale had been signed. It is not probable that the mills would have been started for Monday's work if the scale had been signed, as Tuesday would in any case be observed as a holiday, and it is probable that for the three remaining full days in the week it would not have been considered advisable to start, as repairs are always needed at this time. Thus in any case the disagreement will be of no consequence if it is terminated by the end of next week. Notices have been sent by the Amalgamated Association to the various lodges, asking for further instructions in the matter, and word is expected back from about all by Wednesday next, after which time a further conference can be arranged. As the matter now stands the action will be neither a strike nor a lockout, and after the men have had their week's fishing or other recreation an agreement may be looked for.

Personal.

John W. Gates, chairman of the executive committee of the American Steel & Wire, is mentioned by political friends in Illinois as a candidate for United States Senator to succeed Senator Cullom. Mr. Gates says he is not a candidate; that he could neither get nor take the Senatorship.

Benedict Crowell, mining engineer and chemist, Cleveland, is in the Birmingham, Ala., district looking up iron ore deposits.

H. L. Hebebrand, manager of the Erie City Iron Works, Erie, Pa., for 14 years, died at his home in Cleveland on June 14.

Wm. B. Ridgley, who has been appointed manager of the six mills of the Republic Iron & Steel Co., in the Chicago and Northwestern district, has resigned as postmaster of Springfield, Ill.

John G. Moore, of the New York banking firm of Moore & Schley, well known in connection with several of the iron and steel consolidations, died at New York, June 23.

WM. H. WOOD, the well known hydraulic engineer, of Media, Pa., has been approached by capitalists to incorporate, the object being to increase the facilities for building his hydraulic specialties and steam hammers. The names of the parties are withheld for the present.

AMERICAN Pig Iron Storage Warrant Co. stocks declined 19,000 tons in May. In June up to the 20th the amount taken out was 10,900 tons and the amount received 200 tons. Net stock in yard, June 20, 56,400 tons. On Jan. 1 warrant stocks were 150,800 tons.

LAKE SUPERIOR IRON MINES.

The feature of the market in Lake Superior iron mining stocks the past week is the rapid advance in Republic Iron Co. stock. This is traceable to a circular letter received by the Cleveland stockholders June 26 asking for options on their holdings at 20, less commission of 50 cents per share. These letters were from J. B. Breese & Co., bankers and brokers of Chicago, and the option asked for is to extend to Sept. 1. It was stated in the blanks sent for signature that if a price higher than 20 should be secured for the stock by the holders of the options the difference would be paid to the stockholders; it was also stated that any dividends paid prior to Sept. 1 should go to the persons giving the options. The stock recently has sold for 13½. Since the receipt of the circular it has gone as high as 17 and considerable sales have been made. The theory is that the stock is sought by a consumer of ore. It is said also, that with the present outlook in ore and the prospects of the mine the stock is intrinsically worth more than recent quotations. There is a supply of severa years in sight, at the rate of 125,000 tons a year. The number of shares is 100,000, par value $25.

As an index of the every-day scale of operations in ore carrying, mention is made of four cargoes delivered at South Chicago one day last week, aggregating 24,175 gross tons: Steamers M. A. Hanna, 6,200 tons; Superior City, 6,575, and, McDougal, 6,300, and the schooer Constitution, 6,300 tons.

The steamer Henry W. Oliver, on her third trip down the lakes, brought to Lake Erie dock on Tuesday, 6,945 gross tons, the largest cargo ever carried down by a vessel under her own steam. The record has been exceeded by a barge, the John A. Roebling having made a record of 7,023 tons. The Oliver's record was made on 18 feet of water. The preceding cargoes of this vessel were 6,500 and 6,731 gross tons, the latter on a draft of 17 feet 9 inches. The barge John Fritz carried 6,960 gross tons from Duluth to Conneaut recently, and the steamer Superior City, 6,823 gross tons for Escanaba to South Chciago, on deep draught.

The Oliver Iron Mining Co. has taken an option on the Sibley property in Sections 27 and 26, on the Vermillion range. The ore deposit extends in a northeasterly direction from the Chandler through the Pioneer, Zenith, Sibley and Savoy. The Oliver leases and options on the Vermillion range take in a chain of properties two miles long.

THE regular monthly meeting of the Pittsburg Foundrymens' Association was held at Frohsinn Hall, Pittsburg, on Monday evening. The meeting was called to order by President Wm. Yagle, with nearly 30 members and visitors present. The association had expected Dr. Kemery to be present to give a talk on "The Chemistry of Cast Iron," but as he was unavoidably detained the talk will probably be given at the next meeting. Mr. S. H. Stupakoff took his place and gave a very interesting talk of foundry records, which was followed by a general discussion. The meeting adjourned until September, it being the custom to hold no sessions in July and August.

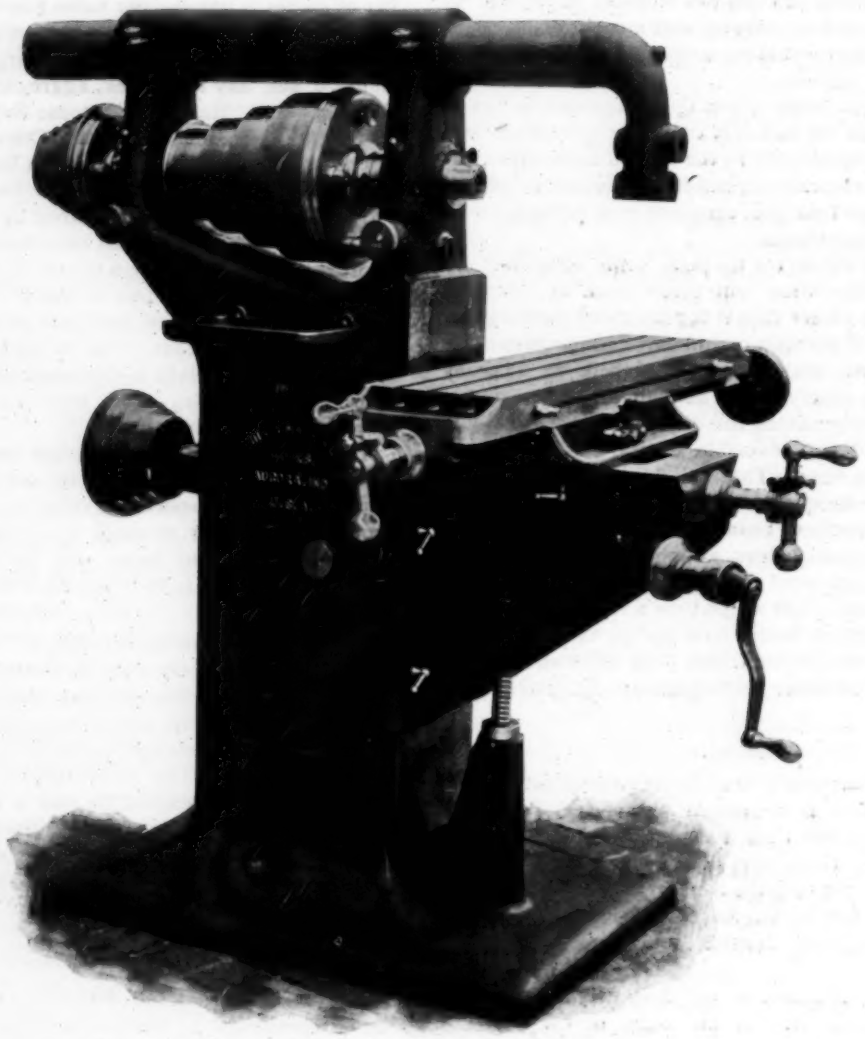
IT is reported that the wire fence manufacturers who have been represented as entertaining plans for the building of a steel plant and rod and wire mills, have entered into an arrangemnt with the American Steel & Wire Co., under which wire is sold them on an agreed scale of prices. There are 13 wire fence manufacturers in the arrangement, which involves also the establishment of prices on their product.

FOR more than a week the Cleveland Foundry Co.'s plant, Cleveland, has been shut down because of a demand of the men that a foreman who rode on a street car manned by a non-union man, in the recent street car strike in Cleveland, be discharged. The company naturally refused to comply. An effort will be made to re-start the works this week. The trouble is probably the silliest example of the "sympathy" strike on record.

THE Empire Iron & Steel Co. has leased the Curtin charcoa furnace at Roland, near Bellefonte, Pa. It will be under the management of Walter Kennedy.

HISEY MILLING MACHINE.

A milling machine designed and manufactured by the Hisey Machine Works, of Aurora, Ind., is shown in the accompanying illustration. One of its features is the enclosing of the back gear in the cone pulley. Another noteworthy feature is the friction clutch, a convenient and simple provision for manipulating the feed screws, as shown on the ball crank handles. Feed changes are accomplished by internal gearing in the cone pulley, which is placed on the rear end of the spindle.



Tennessee Coal, Iron & Railroad Purchase.

The directors of the Tennessee, Coal, Iron & Railroad Co., at a meeting in New York last week, ratified the purchase of the property of the Sheffield Coal, Iron & Steel Co., at Sheffield, Ala., already noted in these columns. The purchase price is said to have been about $850,000. There are three furnaces, two of which are in blast, 300 coke ovens and several thousand acres of coal land. The directors also ratified the contract by which the Tennessee company sells for $1,100,000 cash to the Louisville & Nashville and Southern Railway Companies its railroad property in Alabama, these two roads entering into a contract to reduce by 30 per cent their present rates for carrying ore, coal, coke and dolomite to the Tennessee company's plants. The government has just completed a system of locks and dams which make navigation above Sheffield possible during all seasons of the year. At present the navigation from Sheffield below is open about six months in the year. With the removal of the Colbert shoals, which will require 10 or 15 months, the company will enjoy the benefits of water transportation at all times.

A specimen of the sort of litigation that comes in the iron trade in a time of rapidly rising values is the suit in prospect over Etna furnace at Ironton, O. The Etna Coal & Iron Co. deeded the property to Messrs. Lee and Clark, of Philadelphia, as trustees, to secure a loan of about $100,000. The deed contained a provision for the sale of the property by the trustees in case of non-payment. The company failed to pay and the trustees sold the property to the grantees. There was a protest on behalf of parties in interest that there should have been an order of the court, as the trust deed was in effect only a mortgage; further that the grantors had an equity of redemption which the trustees ignored. When Col. H. A. Marting and associates bought the furnace notice was served upon them of this claim, and the trustees gave the Marting party a guaranty against the disturbance of their title. When the furnace went in blast, the price of iron having risen rapidly meanwhile, the Etna Coal & Iron Co., the original owners, asserted their rights under the equity of redemption and proposed to pay off the amount due under the original trust deed, about $125,000, or $35,000 more than Col. Marting and associates paid; also to repay to the present owners all the money they had expended in additions and repairs. This the present owners naturally refused to accept and suit is now being prepared.

The Sheet Mill Consolidation.

A number of sheet manufacturers have expressed the opinion that the deal for the consolidation of the mills will not be put through. The trade is in such condition that manufacturers are not anxious to enter into the arrangement. The difficulty seems to be that the promoters are not satisfied with the figures asked for two or three of the poorly equipped plants, and it is proposed to leave these out. No active work in the matter will be done before the cooler weather and until then no definite prediction can be made.

F. H. Morgan, treasurer and manager of the Morgan Spring Co., Worcester, Mass., died on June 19, aged 65 years.

METHODS FOR THE IRON LABORATORY—III.

BY FRANK L. CROBAUGH, CLEVELAND.

Manganese.

In my opinion there is no method more accurate and direct than "Volhard's" method for the estimation of manangese. It may be found described in "Common References." One description differs from another in minor details only. For material varying in manganese from 2-10 of 1 per cent to 8 per cent, one gramme is a suitable quantity for analysis. In case of higher manganiferous material, as ferro manganese or pyrolucite, one-half gramme to one-quarter gramme would be a more suitable amount.

For steel, weigh one gramme into a beaker five inches altitude by three and one-quarter inches top diameter, without lip, add 30 c. c. of silicon mixture, (see under determination of silicon) keep covered and force solution rapidly—best upon a hot iron plate. When it is complete remove the watch glass and evaporate the mass to dryness until fumes of sulphuric acid appear copiously during two minutes. Allow the beaker to cool, add 50 c. c. of water and boil vigorously until the sulphates of manganese and iron are completely dissolved. There may at this time appear flocks of silica, or graphite, or both, which have no effect upon subsequent operations. Fill the beaker with water to within three-fourths of an inch of the top. Bring to boiling, remove from the plate, add zinc oxide portion wise, stirring vigorously between additions, until the supernatant liquid shows that all iron has been precipitated. Add a gramme or two of zinc oxide in excess, stir vigorously and titrate immediately with a standard solution of potassium permanganate, which should be added rapidly, stirring vigorously between successive additions. The precipitated mass settles rapidly and admits of inspection for the faint pink and reaction in supernatant liquid. When a positive pink has been reached stir again. If it persists the end reaction has been reached. The last stirring and incident delay of about one minute is always indispensible, as the oxidation is not very rapid. Much pains must be taken to titrate as rapidly as possible, thereby preventing cooling of the beaker's contents, which will always retard the action of the permanganate. Baking the dry mass to the extent named is always sufficient where the combined carbon does not exceed one-half of 1 per cent. In event it is much higher than this the baking should endure through a period of ten minutes, lest some of the combined carbon remain in a condition capable of being oxidized by permanganate.

In event of very high combined carbon, as in white iron or in malleable iron castings, I would recommend to dissolve the metal in rather strong nitric acid. Evaporate its solution to hard dryness, take up in minimum quantity of hydrochloric acid, sp. gr. 1.20, add silicon mixture, and proceed as in the first instance. It is always necessary that a considerable quantity of sulphuric acid be left in the seemingly dry mass, for experience has taught that a little sulphuric acid to form zinc sulphate is quite indispensible to a nice end reaction. If baking be too long continued some oxide of the iron will be formed and will not dissolve when treated with water. This oxide of iron might entangle some manganese.

Proceedure in case of pig iron should be identical with that for steel. The flotent graphite will be entangled with the precipitated iron and will nowise interfere. In case of iron ore complete solution must be affected in hydrochloric acid, sp. gr. 1.20, mixture added, with further proceedure as above. In case of bog ore or rocks containing organic matter the baking must be severe, or in event of very much organic matter in the ore add strong nitric acid to its hydrochloric acid solution, evaporate to hard dryness, take up in hydrochloric acid, add the mixture, when proceed as above.

Practically, combined carbon and organic matter are not hindrances to routine work with this method. In my experience no cases have arisen where high results have been due to them. The above precautions are safeguards. This method differs from those ordinarily described in complete neutralization with dry zinc oxide, which is superior to using an emulsion of the same in water, because in a beaker of the size indicated the volume must be limited, and again, the cold emulsion would lower the temperature. Under no circumstances, after the addition of zinc oxide, should the liquid be brought quite to boiling, as, under these conditions, it is said some manganese may be precipitated.

In operating upon higher manganiferous materials, after solution of the sulphates in a little water, they may be transferred to a larger beaker and diluted with 500 c. c. of boiling water. In this case the addition of a large quantity of permanganate solution required, will not have too great cooling effect. Time allowed for the end reaction must be greater when the percentage of manganese is large. In certain cases, if the operation has been retarded, a heating nearly to boiling, without exposure to bright light, may be necessary. This is not recommended by me. To ascertain the end reaction, care and experience are necessary. An analysis begun and ended in the same container has obviously much in its favor. In this respect I consider the method described superior to the usual method of taking 1½ grammes of the material, its transfer to a 300 c. c. flask where precipitation is effected, dilute to the mark, agitated, allowed to settle, add 200 c. c. of the supernatant liquid drawn off in a pipette, again heated and titrated.

In my experience the precipitated iron and excess of zinc oxides entangle and settle the precipitated oxides of manganese more rapidly than they will settle in the 200 c. c. portion drawn from the flask. A zinc oxide for this process, free from any oxidizable material, is necessary. There are such oxides on the market, but before using them they should be carefully tested. To do this dilute one c. c. of sulphuric acid, sp. gr. 1.84, to the usual volume, bring nearly to boiling, add zinc oxide in excess and titrate, with permanganate. If the correction be more than 3-10 of a c. c. the oxide is unfit for use because a correction cannot be adjusted with nicety. On iron or steel this method may be carried out within one hour. In case of ore, still longer time is required. The use of silicon mixture has great advantage over consecutive additions of its constituents, since it furnishes just the proper amount of sulphuric acid and may be evaported with great rapidity and no spattering.

A description of the Acetate and Potassium Chlorate methods for the separation of manganese (see "Common References") will show them to be more laborious and expensive than the foregoing process, which avoids many errors possibly incident to them. It is the only method which can be called short, where the estimnation of manganese does not depend upon some previously standardized material. In verifying its results I prefer the Acetate method completed by weighing as the phosphate.

The Colormetric method is often used where very rapid approximate results are demanded. The value of a permanganate solution may be ascertaind by use of the following equations:

Let Fe = Iron value of permanganate solution.

Let Mn = Manganese value of permanganate solution.

Then $Mn = Fe \times .2946428571$ or $Mn = \frac{.058928571}{R}$

[For value of R see last paper.]

The American Foundrymen's Association recently placed upon the market a number of carefully standardized samples of cast iron. The work upon these samples was done by Messrs. Cremer & Bicknell, Booth, Garrett & Blair, Mr. McCreath and Prof. A. W. Smith. The results furnished with the standards are an average of the results obtained by these men. They used different methods. In standard "C" they call manganese .442 per cent. I make the manganese by the above method .460 per cent. In standard "D" they make the manganese .971 per cent, I make it .99 per cent, and in a sample of ore Feb., 1893, Mr. Cremer reported 8.56 per cent manganese by the Acetate method. I obtained 8.42 per cent by the above method. In another sample of ore Rattle reported 8.10 per cent, Crobaugh 8.10 and Dickson 8.06 per cent; all were by some variety of "Volhard's" method.

Results by several chemists which show a wider difference than is usual, follow. The material operated upon by them was ore which it seems to me could not have been homogeneous:

E. E. Johnston, Ashland Iron & Steel Co., Ashland, Wis.	.97
F. L. Crobaugh, Cleveland, O.	.86
O. Levan, Alice Furnace, Sharpsville, Pa.	1.10
D. K. Smith, Claire Furnace, Sharpsville, Pa.	.92
E. R. Sanborn, Stewart Iron Co., Sharon, Pa.	.88
J. Hayes, Mabel Furnace, Sharpsville, Pa.	.91
E. B. Hull, Atlantic Iron & Steel Co., New Castle, Pa.	.95
W. E. Dickson, Spearman Iron Co., Sharpsville, Pa.	.86
A. C. Smith, Central Furnace, Cleveland, O.	.89

THE AULTMAN CONVEYOR CHAINS.

The Aultman Co., of Canton, O., has recently placed on the market a very complete line of chains for the transmission of power and for elevating and conveying service. The chain shown in Fig. 1 represents a class entirely new. Its salient features are strength, durability and moderate first cost. The side bars are interlocked with each other. The renewable wearing band or sleeve is socketed into the inner face of the side bar, but is free to turn in the socket and around the bolt. The working strain is borne largely by the wearing bands or sleeves instead of the bolts. The bolts are secured by a nut lock and need not be riveted unless so desired. The links are thus well protected from dust and grit, but can be readily separated and unco pled. The uncoupling can be done with the chain as tight on the wheels as it should ever run. Only moderate lubrication is needed as the lubricant is in a great measure protected from dust and grit. The different sizes and working strains for single strands are: No. 780, 3,000 pounds; No. 850, 7,000 pounds; No. 1030, 3,500 pounds; No. 1080, 9,000 pounds; No. 1220, 12,000 pounds; No. 1240, 10,000 pounds. For work requiring greater strength the chain can be worked in double strand.

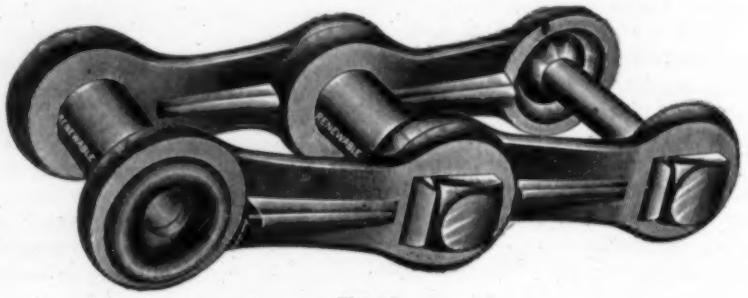


Fig. 1.

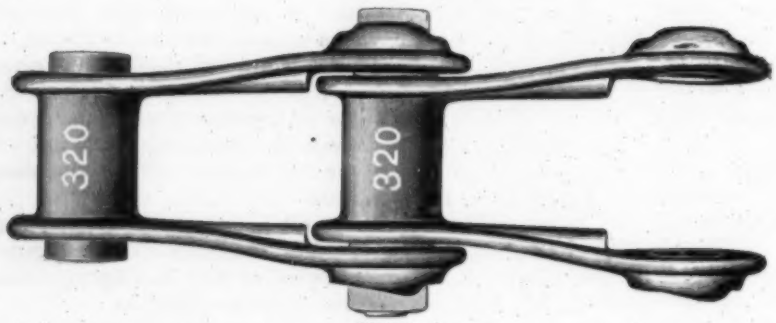


Fig. 2.

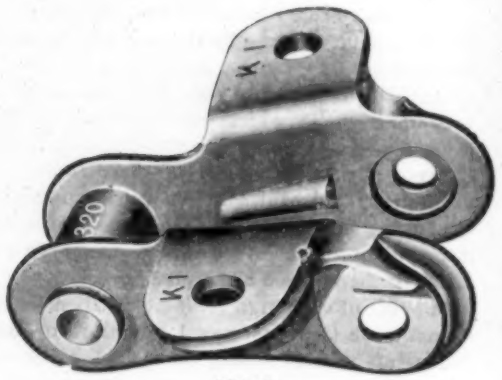


FIG. 3.

All standard or special attachment links are furnished with this chain.

Another class of interlocking chain belt is the pintle type as illustrated by cuts of No. 320 and 320 K 1, in Figs. 2 and 3, respectively. The construction and design of this chain secures the greatest wearing surface and strength with minimum weight. The wear is entirely on the cross bar and interlocking socket joints which are practically dust proof. The chain articulates freely and easily, and is well adapted for any purpose common to detachable chain belt. The construction allows the chain to be used with either side to the sprocket, or one side can be worn down and the chain reversed. The chain is made in all standard sizes and supplied with all standard attachments.

Sprocket wheels for these chains are furnished with chilled teeth or semi-steel mixture, where extra severe service is to be met, or the usual gray iron wheels can be had. The wheels are illustrated in Figs. 4 and 5.

Still another departure in chain design and construction is shown in the scraper and conveyor chains of the types of No. 425, No. 450, and No. 475, as in Figs. 6, 7 and 8.

The good features of design and construction, as noted in the case of chain No. 320, are followed, producing in the case of each of the chains illustrated an article well fitted to perform the work for which it is intended. The Aultman Co. will be pleased to send its new chain catalogue and discounts to those interested.

INVESTIGATIONS OF BOILER EXPLOSIONS.*

BY GUS. C. HENNING.

In spite of the numerous boiler explosions constantly occurring in all kinds of service, and the numerous investigations of their causes which have been made officially and otherwise, no general method has thus far been proposed which gives any certainty of reliability of conclusions. The well-known boiler tests made by a government board of the United States, at Sandy Hook, gave only negative results, and were of little practical value. This seems very strange, more especially when it is considered that the fundamental causes are very limited in number. They are:

1. Excessive pressure.
2. Defective material.
3. Low water.
4. Defective workmanship.
5. Local defects.

Excessive pressure can be produced by wilfulness or by careless operation; it can be controlled by autographic recording gauges, alarm whistles, and competent management.

Defective material can be readily avoided, and should never be used in any case; it is criminal to use it.

Low water may be the result of not only carelessness, bu of many accidental causes, such as derangement of pumps, or injectors, stoppage of pipes, gauge glasses, valves, etc., or even by suddenly augmented leakage, which cannot always be discovered promptly, or even immediately provided for after discovery.

Defective workmanship exists more or less in all boilers, except those which are built without caulked seams and rivets, and punched holes, and all parts of which are prepared and finished by machine tools, and consist mainly of tubes with screwed ends. Defective workmanship develops greater or less defects during service and necessitates constant repair and patching, and may be cause of material weakness in course of time.

Local defects may exist in all boilers initially or develop after a while in service.

1. Determination of excessive pressure. Assuming that a boiler has been properly designed there will be no excessive pressure in service except as previously stated. If all the possible safe-guards have not been employed and a record of pressures has not been made, it is still possible to obtain such record for the instant of explosion, by making several tests of strips especially when cut from material of different thicknesses taken from the boiler. It is a well-known fact that all material used in construction is subjected to stress about

*Read at the Washington meeting (May, 1899) of the American Society of Mechanical Engineers.

one-third of its yield point, but never beyond one-half of this amount. Stress sufficient to cause rupture is always about five times the working stress. If then any part of the boiler had been worn thin by corrosion such material would be overstressed and overstrained.

It is also a well-known fact that excess of stress beyond the yield point invariably raises it above its original value, and if, therefore, careful tests be made of the material, especially with an autographic recorder, the results will invariably show augmentation of yield point. Different thicknesses will show different augmentations which must always be in direct proportion to the stress applied. If calculations show that the augmentations of yield point in thick and thin material were produced by the same internal pressure, then it is proof positive that excessive pressure existed at the instant of explosion, and also its exact amount. Tests of staybolts will show the same thing. Elongation of the material, is however, reduced by excess of stress, and a second tension test of a piece of material previously ruptured will be very materially decreased. Stress beyond the yield point also changes the shape of the elastic curve in a very characteristic manner.

2. Determination of defective material. As it is assumed that all material used in a boiler originally was of good quality, it is only necessary to discuss the changes which might have taken place while in service. It is also assumed that all parts of the boiler are open to inspection at all times, and that, therefore, any local corrosion will be discovered at once and carefully watched during its progress. Ocular inspection is always sufficient for this purpose, and such defects are always visible and easily recognizable before and after failure, and the latter can only occur under the most careless supervision. In service, material may, however, deteriorate by the action of repetitive stress, the effect of which is again clearly indicated by the results of tests and, more particularly, by carefully drawn diagrams. The yield point will again be changed as before and the elongation similarly. However, different parts of the boiler would show different effects according to their location, and the different action which each is subjected to would produce different results of tests. In the case of excessive stress the differences would be the same in all material in the boiler. Moreover, a careful study of the results will show other differences which are most fully described in the reference given. These changes of material are, however, produced only by such an immense number of repetitions of stress that they are rarely produced in boilers, which generally wear out and are replaced by new ones before they become distinctly developed.

Long-continued service of material in contact with fire and gases of combustion also produces very marked changes in structure and properties of the materials. The structure becomes more crystalline and brittle. It loses much of its ductility. While the yield point and tensile strength are not much changed, the former generally being lowered, the elongation is decreased materially. Bending tests on both cold and quenched material show considerable deterioration. Nicked bending tests especially produce striking differences. As different parts of the material are affected differently because of difference in temperatures of the fire, they will show different qualities in material and in proportion to these temperatures This being the case, the cause of such deterioration can be easily traced by careful tests; it is, however, essential that complete records of tests be obtained, which is of course possible only by autographic records. It does not suffice to make the usual determinations of ordinary tests. It has never been demonstrated that boiler plate, other than that subjected to the action of fire and hot gases, has had its properties changed by long-continued service.

3. Low water. Low water, however caused, always pro-

FIG. 4.

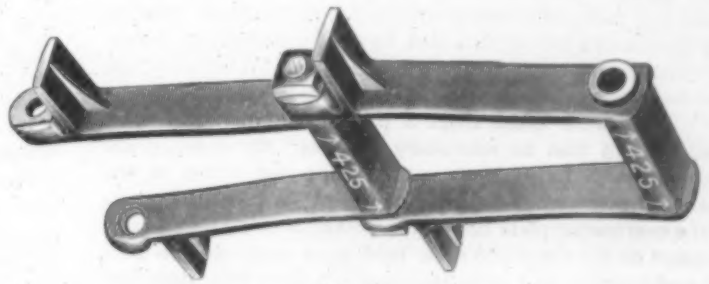


FIG. 6.

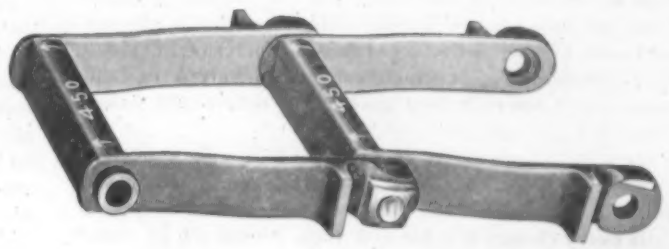


FIG. 7.

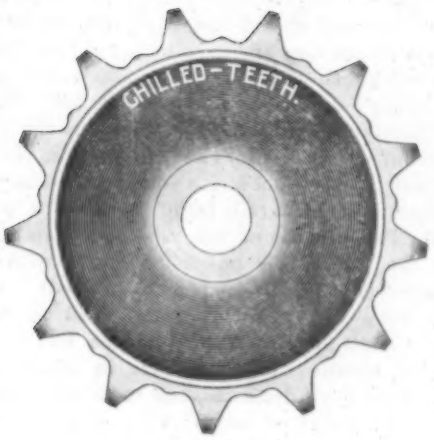


FIG. 5.

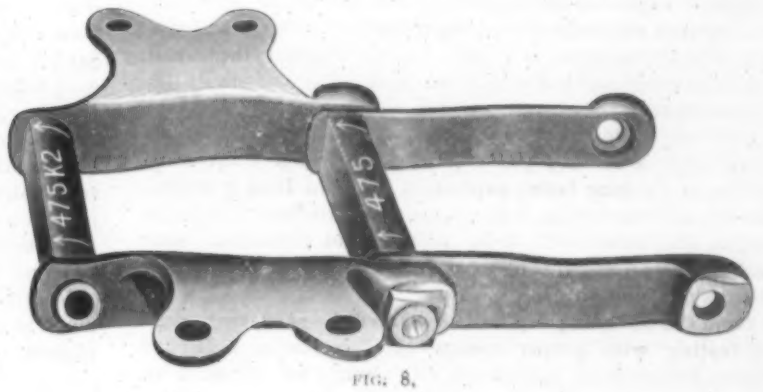


FIG. 8.

duces excessive heating; and if the temperature rises sufficiently to weaken the material, failure may occur by stripping of the staybolts or rupture of the sheets by bulging between them, or otherwise. If the temperature has raised the material to a low or bright red color, this can be readily determined by superficial inspection. While the fire side will show red rust or a black color, the water or steam side will invariably show a typical steel-blue scale, which will not disappear even after years, as it is a so-called rustless coating. If this be once oiled it will always be distinguishable, even if the plates had been exposed to moisture and gases for years. The color of this scale will depend somewhat upon the temperature at which it is produced, being brightest at those points where temperature was the highest. Carefully made tests, with autographic diagrams, of such material will again demonstrate changes of properties, which are very characteristic. The yield point will be found very low, while the diagram will show a material drop of curve just after the yield point. The elongation will, however, as a rule, be materially increased, with a diminution of tenacity. Nicked and quenched bending tests will again show marked differences between strips cut from the sheet at points which in one case were overheated or were above the low water line, and in the other were taken from a part below this line. The fracture will also be materially different To demonstrate the temperature at which the plates happened to be at the instant of explosion, it is necessary to cut strips from points of the overheated plate below the water line. These strips polished on the edges are then held in a clear fire so that one end remains cold while the other is heated to a dull yellow or a very bright red. This temperature being reached the bars are withdrawn, and while one is rapidly plunged with one end into a pot of boiling water, the other is allowed to cool in air, but not in contact with wet material or metal or stone. When the piece which had been immersed in boiling water about one inch deep has become nearly cold, below blue heat, it is plunged into cold water.

On the polished edges of both bars will be found scale and heat colors, the temperatures producing them being well established. These bars are then carefully nicked at points opposite every change of color and then broken off at these nicks. By comparing these fractures and their scale and colors with those obtained from pieces cut from the overheated plates, the temperature at which they were at the instant of explosion can be determined with great accuracy. Having thus determined the temperature at which the sheets were during operation, it is also known whether the metal was sufficiently soft to bulge or to strip from the staybolts; examination of plates and bolts will verify the conclusion.

4 and 5. Defective workmanship and local defects. As these must be of very grave importance when sufficiently serious to produce boiler explosions, and are readily noticeable to any trained eye, it is not necessary to discuss them at length; they have often been studied and described. The literature on these subjects is so ample that their enumeration may be omitted.

From the foregoing explanations, it will be seen that careful testing with proper means and apparatus, added to thorough superficial inspection, will always be sufficient to demonstrate the cause of any boiler explosion. It is the failure to apply correct knowledge in individual cases that has led to the frequent conclusion of "cause unknown", or "no reason for accident." The failure of eminent engineers to reach definite results is due entirely to inadequate investigations, which did not discover the facts available. Moreover, the tests of the material after explosions were made in such a superficial manner, and with such inadequate methods, apparatus, and care, that they were generally valueless.

In my experience I have repeatedly found the results of tests of so striking a nature that this, taken in connection with the knowledge of original properties of the material, gave convincing proof of the causes of explosions. This is not only true of sheets, but also of flues, both of which I have had repeated occasions to study carefully, and there does not seem to exist any doubt whatever that the cause of every boiler explosion can be readily determined with simple means readily obtainable, by one who has correct and sufficient knowledge of properties of materials as affected by different conditions.

WIRE NAILS FROM OLD STEEL RAILS.

TO THE EDITOR:

In addition to what you have already commented upon in your issue of the 22nd inst., with reference to utilizing old steel rails for the purpose of making wire nails, I have this to say

I have made several experiments with a view to finding out if the quality of steel contained in old steel rails is suitable for conversion into wire nails; and every experiment so far has been favorable. In fact, we have taken the crop end of a 100-pound rail, which contained .60 carbon, rolled it into wire rods, drawn these into wire, and made nails in some respects superior to those made from soft carbon steel, seeing that they are more rigid and will drive into hard wood much better. Of course, the expense of drawing hard steel is higher than that of drawing soft steel, but the difference between the first cost of an old steel rail and a soft steel billet is such as to warrant the expenditure and yet be on the safe side. As a further evidence that a steel rail quality of steel is suitable for making wire for even different purposes, I may state that from 1871 to 1881 steel rail crop ends were the chief source of supply for the wire mill of the Cleveland Rolling Mill Co., and part of this product, made from steel rail crop ends, was made into wire used for springs, the quality of which was so good as to make such important manufacturers of wire as the Washburn & Moen Mfg. Co., green with envy, they not being able at that time to produce spring wire nearly as good in quality. At one time the Cleveland Rolling Mill Co. had not only the preference, but could command a higher price for its spring wire than any of its competitors. In 1880 there were 15,890 gross tons of wire rods made by this company from rail crop ends, and in 1881 17,459 tons were made.

If the above is so, it might be asked why this method was discarded. This can be easily explained by stating that crop ends were naturally short, and did not weigh more than from 30 to 60 pounds, hence as the demand arose for heavy weight rods, say from 140 to 225 pounds, short rods became objectionable. In the using of old steel rails this objection is removed, seeing that a 60-pound rail 30 feet long—the standard length—weighs 600 pounds. This can be cut into four pieces, and yet have each billet at least 140 pounds in weight. Again, under the old steel pool arrangement, steel rails were sold for, say, $28 per ton, while soft steel billets went as low as $15 per ton.

When we look back we find that 4-inch steel billets reached the bottom notch at $13.75, and old steel rails at that time were selling for $8 per ton; and even to day old steel rails are $15 per ton while 4-inch Bessemer steel billets are $32 and open-hearth billets between $37 and $38 per ton. Again, at the present time there is a famine, probably the greatest famine this country ever saw for raw material in the shape of iron and steel. Does it not strike you, if my ideas are correct with regard to old steel rails being suitable to be made into wire nails, that it is one of the most important things to bring before the public, this possibility, nay probability, of utilizing old steel rails for the purpose mentioned?

In order to make wire nails from soft steel as they are made to-day, ore has to be shipped from the Lake Superior regions, several hundreds of miles, coke in many instances has to be freighted great distances, and in most cases 4-inch billets have to be freighted many miles, to be then rolled into rods, drawn into wire, made into nails, and afterwards shipped in kegs, often thousands of miles, to reach the district in which they are to be used. All this while such cities as Kansas City, Minneapolis, St. Paul, Duluth, Omaha, St. Louis, Louisville, Denver, and going across the Rocky Mountains, Salt Lake City and San Francisco, have the raw material at their very doors necessary to make wire nails. And this when old steel rails within a radius of the sections named have to be shipped hundreds of miles before they reach a point where they can be used, chiefly for melting purposes.

In stating above the minimum and maximum prices of old steel rails, this does not mean the price of the steel rail where it is picked up, but where it is delivered; hence the using of old steel rails within a certain radius of the point where they are taken up, gives still another margin in favor of using them as I suggest. To me it seems somewhat remarkable that the merchants and consumers of wire nails located within a certain radius of the locations I have mentioned above should raise a wail, bordering on a groan, at having to pay

$2.40 to $2.50 for their keg of wire nails, with freight added from Chicago or Pittsburg, whilst at their very door lies the raw material from which a wire nail can be made. It reminds me of the story of a sea captain and his crew, who had encountered severe storms for several weeks, and the fresh water on board had become exhausted. They one day saw a strange sail and hoisted a signal of distress. On this being recognized they conveyed word of their dire plight, crying "Water, water, or we perish." And the answer came back, "Dip and drink." They had drifted unknowing into the mouth of a fresh water stream.

This may sound a little flowery, but a little yeast in the shape of a practical method of converting old steel rails into wire rods will convert the whole of the above into good, sound, wholesome bread.

I might prolong the argument indefinitely, by citing the many benefits this country would derive in this age of trusts when the poor down-trodden workingman's pail is overtaxed with what it contains; how he would get his nails cheaper to fix his chicken-coop; the farmer get his nails cheaper to fix his fence; the carpenter get his nails cheaper to put up buildings; the railroads get their rails cheaper through having over half a million tons of steel which was made into nails in 1898, thrown on the market, to be made into rails, tin plate bars, etc., besides the little they might gain by the freighting of old steel rails long distances as they are doing to-day.

Now the next question that naturally arises is: Where are we going to get the old steel rails? Let us look at the question from this point. There is a limit to the life of everything—even to the life of those gigantic trusts which are being formed to-day; so also is there a limit to the life of a steel rail. Steel manufacturers guarantee a rail to last 15 years, and some steel rails may be found to-day (I question if on the main lines) that were laid over 25 years ago. But it is generally conceded that 20 years is a fair average. Again, many rails are being taken up to-day, owing to heavier traffic and heavier rolling stock. In 1870, cars carrying 15 tons were about the average, and now it is common to see 50-ton cars.

Hence railroads have to use heavier rails and take the light rails up before they are worn out. Let us assume all rails removed for that cause are used by the railroads to improve their sidings, etc. In 1879 there were 610,682 tons of steel rails made in this country; so that, if 20 years is the life of a steel rail, that amount is used up by this time. In 1880 there were 852,196 tons rolled. In 1881, 1,187,770 tons were made, and from that point on, with the exception of the years 1884 and 1885, there was a steady increase, the maximum being reached in 1887, when 2,101,904 tons were made. So that if 20 years is the life of a steel rail, there will be 2,101,904 tons of old steel rails to be disposed of in 1907. As there has been about 25,000,000 tons of steel rails made in this country since the Bessemer process was introduced, so far as the raw material required for the purpose of making wire that can be used from the rail quality of steel is concerned, the visible supply is enormous. True, the open-hearth process will take a large quantity of this, but why melt what can be used without melting?

Mr. Hill, of the Great Northern, has shown great interest in getting at the markets of China and Japan. Rumor has it that he is about to build up a fleet to connect with the western terminus of his road, and sparing no expenditure to get at these markets. It has been stated that he is going to take up over 200 miles of his road and put down heavier rails. These old steel rails will have to be carried thousands of miles in order to get to a point where they can be used—the large consumers being no nearer than Chicago—thereby bringing material thousands of miles East. The charges for freight on these rails will have to be borne by the seller, and to meet competition of roads nearer the market, freightage will amount to a large part of the market value of the rails at the point delivered. Whereas, if old steel rails were to be used as the writer suggests, then the finished product could go westward to the nearest shipping point, and utilize Mr. Hill's fleet to carry it to Japan and China, the greatest and most desirable outer markets for wire and nails this country has.

WM. GARRETT.

CHAMPION CUTTING TOOLS.

The illustrations below are of various forms of toolholders and metal cutting tools manufactured by the Western Mfg. Co., Springfield, O. Fig. 1 is the Champion boring tool attachment which is designed to facilitate inside boring and thread cutting, providing for the secure holding of the boring bar so that it will not spring away from the work under the cut. One difficulty experienced has been that when work was calipered on the inside it would be smaller diameter at the back of the cut than where the operator started in. With a very long cut the leverage of the tool on the tool post is such that much difficulty is experienced in fastening the tool so that the tool post will not slip under a heavy cut. The attachment shown has been so perfected that it will fit any lathe, being strong and rigid. It will hold three sizes of boring bars. In attaching it to the lathe the tool post is removed and the T block of the fixture slipped in its place, the back bolt of the attachment being tightened only sufficient to bring the T block up firmly in the tool post slot of the lathe.

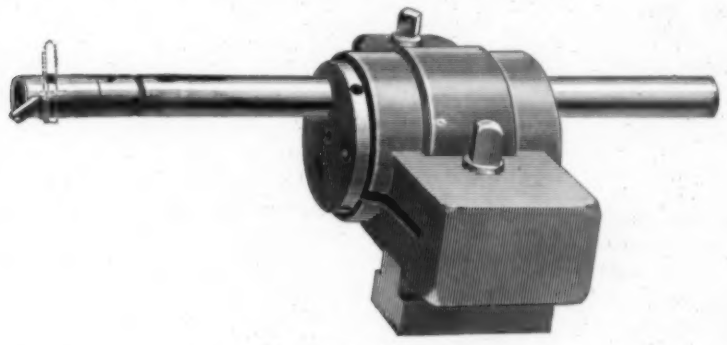


FIG. 1.

FIG. 3.

FIG. 4.

FIG. 2.

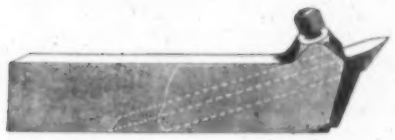


FIG. 6.

FIG. 5.

Fig. 2 shows the Champion cutting-off tool. Plenty of material is provided under the blade. The latter is held firmly but by loosening two set screws the blade may be moved or taken out entirely. The tool holder is forged from steel and the blades are self-hardening steel, or tool steel where desired. Fig. 3 is the Western diamond point tool. Self-hardening steel cutters are used, provided at much less expense than the cost of a forged tool. The cutters are prevented from slipping when in use and can be lowered so that the cutting edge is in line with the top of the tool holder. Fig. 4 gives a side view of the company's patent threading tool. The holders are of drop forged steel, finished true and giving the same clearance for each cutter. The shape of the cutter is designed to give sufficient spring to prevent chattering while cutting the thread. The cutters are made of special tool steel and are furnished for any U. S. Standard V or Whitworth thread. To meet the requirements of some classes of work, a solid holder threading tool is manufactured, as illustrated in Fig. 5. The Champion tool holder, the features of which are its unusually large cutters, supported on their under side, its convenient length and the fact that the point is always at the same height, is shown in Fig. 6. It will work either right or left hand and there are no side projections, permitting its use close into a corner. The rake of the cutter gives a clean, curling chip and no top grinding is necessary. The cutters are made of special self-hardening steel and the points are ground to shape.

LATTER DAY FOUNDRY PROGRESS.

Prof. Ledebur's Summation of Modern Features.

[TRANSLATION AND COMMENT BY DR. RICHARD MOLDENKE.]

But few of the old guard remain to tell us of the foundry business as it existed half a century ago. The rapidity of progress in that time has been such, particularly during the last decade, that there is a very marked tendency to overdo things, and it were well if the ripe experience of our older foundrymen had been drawn upon more freely in the conduct of the business end of many a supposedly modern enterprise. A number of unnecessary installations would have been avoided, and many things which looked quite promising on paper, but turned out to be everything but economical in practice, would at least have had the benefit of an investigation by conservative minds.

The caution of the old when linked with the push and resourcefulness of the new foundryman, forms a combination which can allow him to enter upon the new century fearlessly, to meet and adapt himself to the strange conditions sure to arise. In this connection Prof. Ledebur, the highest European authority on iron, reviews the progress of the foundry industry up to the close of the present century. The article and plates accompanying it take up 22 pages of the issue of *Zeitschrift des Vereins Deutscher Ingenieure*, April 22nd. We make liberal extracts in the translation below:

We are witnessing the close of the 19th century, and as thinking men look backward and weigh the good and evil it has brought us, changes of far reaching consequence in our political and social life, in science and industry, and taken all in all we find that in the latter respect we have done more in this than in the five centuries preceding it. At the close of the 18th century the steam engine had come to assist labor and made us independent of water power, then essential to heavy production, and the forces of nature were thus harnessed for the service of mankind in a greater measure than ever. The more, however, that steam as employed the greater did industrial activity extend, and so with the transportation facilities which came with the railroad, an undreamt of exchange of raw and finished products took place which we to-day are doing our best to still extend.

Early Status of the Foundry Industry.

Even in the foundry, which had developed steadily since the 14th century, this influence was noticeble at the close of the 18th. At that time foundries were adjuncts to the blast furnaces, castings being made of direct metal; in fact we might say the blast furnace was the adjunct to the foundry, for only in sections remote from furnaces did a founder travel about with a portable melting outfit and pig iron to cast the local work, which usually consisted of kettles, stove fronts, weights, etc. Even where a machine shop was started, the blast furnace and foundry formed the principal item of the plant. It was soon, however, found that the connection of furnace with foundry was rather detrimental to the proper development of the latter, and the iron made on Sunday and scrap products were melted in a separate furnace for casting instead of going to the puddling furnace. There was, moreover, a greater quantity of fluid iron available at one time for the production of heavy castings, and the increased expense of this method was more than counterbalanced by the advantages derived. One was no longer dependent upon the current output of the furnace, but could vary quantity and quality in making castings at will. Further considerations, not necessary to enumerate at length, have gradully separated the blast furnace from the foundry to such an extent that in 1897 but 2.8 per cent of the castings made in Germany were of direct metal, while in 1871 the per centage was 17.2. The production of castings has steadily risen in recent years. In 1871 Germany produced 418,000 tons; in 1887, 795,000, and in 1897, 1,500,000.

The invention of the process of steel casting in 1851, which was expected to injure the foundry trade materially, did not do so, notwithstanding the fact that the casting of steel has assumed enormous proportions. The great demands upon the productive capacity of our foundries will naturally lead to the ultimate perfection of the foundry appliances just now coming into use. Manual labor was the rule in the early years. The introduction of machinery has lowered costs; melting furnaces were improved greatly so that more metal could be melted in them and this with a smaller expenditure for fuel. Science gave us the means of properly mixing and melting the iron. Even the construction and arrangement of the modern plant is based upon different principles than was formerly the case. Such has been the effect of a forced increase in production.

Better Knowledge of Pig Irons.

The views about pig iron current 30 years ago seem strange to us to-day. We all know that white irons were not good for ordinary castings and that the carbon therein was combined, while it was graphite in the gray varieties. The grayer and more coarsely crystalline a pig iron was the higher the price paid for it, and so it came that blast furnace managers in making a cast would often run slag over the pigs to keep them hot as long as possible, thus promoting the formation of very large crystals. When this iron was remelted and the nice large crystals disappeared in the castings the reason why was looked for in vain. It took some time before there dawned upon the minds of foundrymen that a third body, silicon, affected the other two, carbon and iron, to such an extent that a repeated melting of the same iron, by burning out the silicon could lead to serious difficulties, and that therefore the higher silicon gray irons were the more valuable. Blast furnace managers are now pretty familiar with the effect of silicon upon iron, and in some American blast furnaces foundry irons are now cast in chills and sold without regard to fracture appearance. In spite of our knowledge of the uncertainty of fracture indications, pig iron is still graded and sold in this way, and many are the mistakes resulting therefrom. The silicon contents of a casting should be a function of its general dimensions. The heavier the casting the slower it cools, and therefore the lower its silicon contents should be. Hammer dies require little over .5 per cent water pipe, machinery castings 1.5 per cent, and art castings, stoves, etc, over 2 per cent. In making up the cupola charge due allowance must be made for the loss of silicon in burning out. This amounts to 10 per cent on an average.

Manganese, if it was considered at all, was usually held to be a desirable element. It was supposed to strengthen the casting. Whatever this benefit may amount to, its injurious effects are certainly very marked also. Manganese whitens the iron, increases its shrinkage and contraction, aggravates the internal strains, and in general is not desirable in quantites over 1 per cent, especially where the castings are thin have to be machined, or are subject to shock. Water pipe should therefore not run above 1 per cent in manganese. In the cupola, however, manganese is a valuable constituent; it protects the silicon, and hence a high manganese iron can be remelted oftener than one low in this element. This would indicate that the manganese of a pig iron should not run over 1.5 per cent. Phosphorous was long known to be deleterious when present in large quantities, nevertheless many of the ills ascribed to it are traceable to other causes. It promotes brittleness and libiality of breakage under moderate shocks. Its influence is more marked with high manganese and reduced with high silicon. A 1.4 per cent phosphorous iron low in manganese and with plenty of silicon may still be serviceable for castings not subject to severe shocks. Where there is danger to human life as the result of breaking castings 0.5 per cent phosphorous should never be exceeded.

The question of sulphur is not usually a serious one, as the percentage seldom runs above 1 per cent in the ordinary foundry irons. However, if the coke used is rich in sulphur, or an insufficient amount of limestone has been charged for slagging off, the thinner portions of a casting will soon show this. If in charging the coke bed limestone is not added, the first iron trickling through it will be much richer in sulphur than would have been the case if the basic slag had protected it.

A review of the pig iron situation of the continent is interesting and shows that Germany, while formerly dependent upon Scotch and other pig irons for foundry purposes, and still importing over 300,000 tons annually, has succeeded, after a careful survey of its own iron resources, in reducing the

ratio of foreign to domestic iron from 4 to 1 down to 1.3 to 1.

The Question of Testing.

The question of proper testing methods to determine the value of pig and cast iron has received considerable attention. First of all a chemical analysis will give reliable indications of the value of a new brand of pig iron. This analysis should be very thorough, as the presence of some of the rarer constituents may mean mischief. Thus the presence of .1 per cent of chromium means a brittle casting. Physical tests of cast iron are very important and are now universally performed. Attention is called to the fact that a machined bar is stronger than a rough one, and that continued rattling of bars in the cleaning process also removes weakening strains. Finally the effect of the size and shape of a bar is a very important item, all indications pointing to the desirability of having the bar, and the casting it is to represent, as like in section as possible.

In the preparation of pig iron for the cupola, the breaking of pigs into small pieces is now accomplished by mechanical means in many places. A small hydraulic press suitably mounted will allow two men to make 10 to 12 fractures a minute. Where the pig is high in phosphorous, and hence breaks easily, the old way is naturally still preferred

Modern Cupolas and Melting Methods.

For melting the pig iron and scrap the cupola is the rule, the reverbatory furnace the exception, the crucible now being very rare. Only in the making of rolls or very large castings is the reverbatory furnace in one of its modifications used, otherwise the cupola will be found the most convenient. This has been greatly improved in this century. At first the cupola was intended to supplant the blast furnace and was run like it, a single tuyere usually serving to allow the entrance of the blast and a blue flame of burning carbonic oxide from the stack showing the nature of the process. Gradually it dawned upon the ironmasters that the process of reducing ore in the upper part of the furnace to iron and then melting it down below was different from the mere melting of pig iron, and hence the cupola process was gradually changed to what it is at present, for as complete a combustion as may be to utilize all the heat of the fuel for melting only, is desired, no chemical action being necessary. This meant the cutting down of the fuel to one-half. On the other hand the liability to oxidation, the burning out of the silicon and loss in iron was increased, but the net saving was nevertheless very great. So far as the cupola itself is concerned, aside from what the makers of the various kinds claim for them, it is practically only a matter of the tuyere arrangement. Whether this be one row of good wide openings, or two of them with varying distances between, they all, when the cupola is very large, have to contend with the difficulty that the blast does not reach the center readily. The arrangement of Mr. West, however, which provides for a center blast, overcomes this drawback and should be very valuable for cupolas of large diameter. The use of the steam jet to draw air into the cupola, as exemplified in the Herbertz cupola, while very ingenious, is not economical, less steam being used to drive a fan than to draw the same air direct.

The blast for a cupola was formerly obtained from blowing engines, the regular blast furnace apparatus being adapted to supply the cupola also. The excessive pressure was soon found, however, to be a detriment, and cheaper and better means were provided. The reaction in favor of fans, which took place in the early decades of this century, was gradually modified in the sixties, and the modern pressure blower now divides the field with the fan in the foundry industry.

Sand Treatment and Molding Machines.

The use of green sand in the foundry was introduced by Abraham Darby in the early part of the 18th century, and has since then made great advances in usefulness. Where formerly loam was required, as in the case of work molded up by sweeps, for the last 20 years green sand has been used successfully. Special care in the selection and mixing of the molding and facing sands will amply repay itself, and during the last 50 years much of the hand work done in this line was performed by machinery. Centrifugal mixers are invaluable for breaking up and thoroughly mixing the sand, their especial value being in evidence when mixing up facing. This mixture of sea coal and sand (in which the burning of the coal prevents the sand from adhering to the casting) is all the more effective the more intimate the mixture of coal and sand can be made. Hence the advantage of machine mixing over hand. The sifting and conveying of sand mechanically may also be mentioned here.

The most pronounced improvement in foundry appliances is the molding machine. Not only has the cost of molding been reduced considerably, but the castings are truer to the pattern and more uniform in weight. There are two main classes of molding machines; those which use the portion of a pattern to make a whole mold, such as in making gear wheels by machine; and those which withdraw the whole pattern from the mold after it is rammed up. In the latter case the molding machine may be a mere sand ramming device, or it may have a draw plate and be quite elaborate. Match plates were used as early as 1827, and primitive molding machines are now 40 or 50 years old. The use of hydraulic power dates back to 1890, and at the present day this, compressed air, and steam are used extensively.

Dry sand appliances are comparatively unimproved; the same methods of drying molds, which were in use early in the century, may be still seen to-day. After all the main object is to bring dry warm gases in contact with the molds so that the moisture is driven out and removed. For this reason if gas firing is used and products of combustion should not touch the molds, an effective system of ventilation must be provided to take away the steam. In some instances skin drying is sufficient, but there is danger, if the molds stand too long, that the moisture of the body gets to the dried surface again.

The cleaning of castings has been greatly improved. From the old scratch brush and file it went to the revolving brush and grindstone, then came the tumbling-barrels, and finally the sandblast. Pneumatic chipping machines now take the place of the tedious hard work, and one man thus provided can do the work of four.

Improvement in Foundry Buildings.

Foundry buildings and their equipment have changed wonderfully. The two questions studied to-day are cranes and light. Wooden jib cranes run by hand have been replaced by traveling cranes of many types An abundance of light is now the rule rather than the exception, even skylights being provided. The use of the traveling crane has evolved a new type of foundry building—an extended main section of the width of the crane, and side wings or "lean-tos" low enough to give a series of windows above them to flood the central portion with an abundance of light and air.

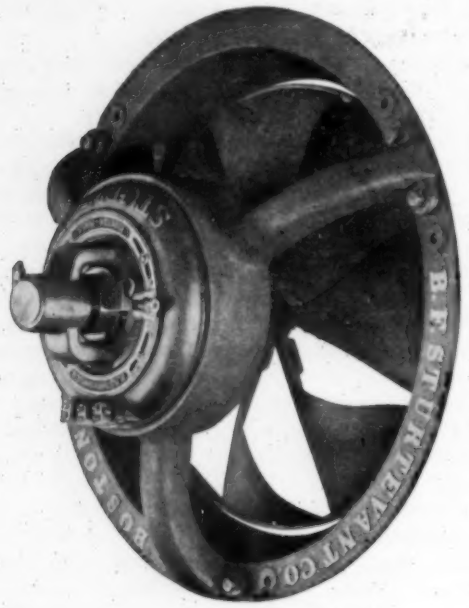
Prof. Ledebur finally describes several modern German foundries, which are also copiously illustrated by a number of exceedingly fine half-tones, and metions the Westinghouse Air Brake plant at Wilmerding, Pa., as one of the advanced foundries of the industry.

The Council of Rangitikei County, New Zealand, has placed an order with the Berlin Iron Bridge Co., of East Berlin, Conn., for a highway bridge consisting of a single span of 204 feet, designed to carry a distributed load of 1,500 pounds per lineal foot, or a road engine weighing 40 tons. In transmitting this order the chairman of the Council says: "As far as I know, this is the first order of the kind sent to the United States, and the experiment is being watched by other local boards." The bridge will be a pin connected structure on account of the ease and facility with which this class of construction can be erected in the field.

Henry L. Schwarzenberg, 407 Cuyhaoga Bldg., Cleveland, has established a trade in the Central West in two important lines—crucibles and metals. The former are manufactured by R. B. Seidel's Philadelphia black lead and crucible works, the line including crucibles for melting steel, brass, bronze and other metals A specialty is the Seidel brazing crucible used by bicycle and other works in which the brazing of frames is accomplished by the dipping process. In his metal trade, Mr. Schwarzenberg represents the Nassau Smelting & Refining Co., of New York, whose anti-friction metals are well known.

ELECTRIC PROPELLER VENTILATING FAN.

Since the B. F. Sturtevant Co., of Boston, Mass., entered exteasively into the manufacture of electric motors and generating sets it has been studying the problem of the manufacture of a compact, efficient and convenient type of electric ventilating fan. Exhaustive tests were made with different types of fan wheels. The result is indicated by the accompanying engraving, giving a view of one of the Sturtevant electric ventilating fans which have just been put upon the market. The fan wheel has eight blades rigidly attached to a spider at the center, and held in place by a hoop at the periphery-



at an angle of approximately 30 degrees. The angle is increased in such a manner that as the center is approached, the theoretical velocity of the air remains approximately constant. In other words the delivery edge is helical, and the air is picked up on the inlet edge of the blades at low velocity. When well under the influence of the blades, it is accelerated to its maximum velocity with the least amount of slip. These fans are built in sizes from 18 to 120 inches. Speed controllers are provided in all cases.

The motor has been the result of careful study in the attempt to provide a light machine, entirely enclosed, and at the same time to avoid the excessive temperature ordinarily incident to the operation of enclosed motors. The result is a machine capable of continuous operation for 10 hours, with a maximum temperature rise of not exceeding 30 degrees F. A practical efficiency of over 80 per cent is obtained even with the small sized motors, and an excess load of 75 per cent above the rated capacity may be carried without sparking, and without changing of brushes. The wheel is partly enclosed in a conoidal inlet ring, which decreases the frictional resistance to the entering air, and furnishes a rigid support for the motor, to which it is attached by the tripod hanger.

Judging Machine Cast Pig Iron by Fracture.

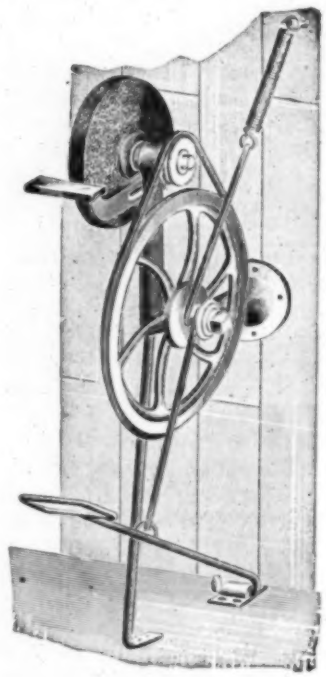
In the last issue of the *Foundry*, W. J. Keep makes these observations on the uniformity of the fracture of pig iron cast in iron molds:

"One of the most interesting and useful exhibits at the convention of the American Foundrymen's Association was samples of pig iron made in the iron molds of the modern casting machine. By casting pigs in iron molds and treating all pigs alike the fracture shows exactly what kind of castings the pig iron will make. With the casting machine the iron is first caught in large ladles and is then poured into a series of iron pig molds that pass under the stream of molten iron. The hot pigs pass through water and are dumped into cars for shipment. The only variables are the condition of the furnace, the temperature when the iron left the furnace, and the chemical composition, but the whole of the iron is collected and held in a ladle until it is of uniform composition, and the pig molds are filled and cooled so rapidly that any chilling tendency is at once apparent in the fracture of the pig. The fracture of sandless pigs is therefore a perfect indication of the kind of castings that they will make. If a non-chilling iron is poured into an iron mold the fracture against the chill will be darker and closer than at the center of the pig. Then conversely, if a pig that was cast in an iron mold shows a darker fracture at the chilled surface it will make a soft casting without any chill. If such pig iron shows a slight chill around the sides of the pig if remelted and cast in a sand mold it will make large castings without chill, but is not fit for small castings, as they would be white.

"If we postpone the discussion of chemical analysis in the foundry a little while until the furnacemen generally adopt casting machines for pig iron, we shalll find that the fracture of the pig made by the machines will show exactly what kind of castings can be made from them. Then there will be no chance for the fracture to be deceptive. There will be no necessity for the founder to have a chemical analysis because he can see the character of the iron he buys. The physical properties of cast iron do not correspond to the chemical analysis, and they will not correspond when all pigs are cast in iron molds, but the fracture will then show exactly what kind of a casting can be made from the pig iron."

FOOT POWER EMERY WHEEL.

The Buffalo Emery Wheel Co., 16-18 Lock street, Buffalo, N. Y., manufactures the Reisch foot power emery wheel, an illustration of which appears herewith. The emery wheel is 6x1-in., the balance wheel 10x½-in., and 2,000 revolutions a minute can be attained. As a knife sharpener, or tool grinder it is a handy machine for use in bicycle repair shops, machine shops, mills, factories and for any service involving light

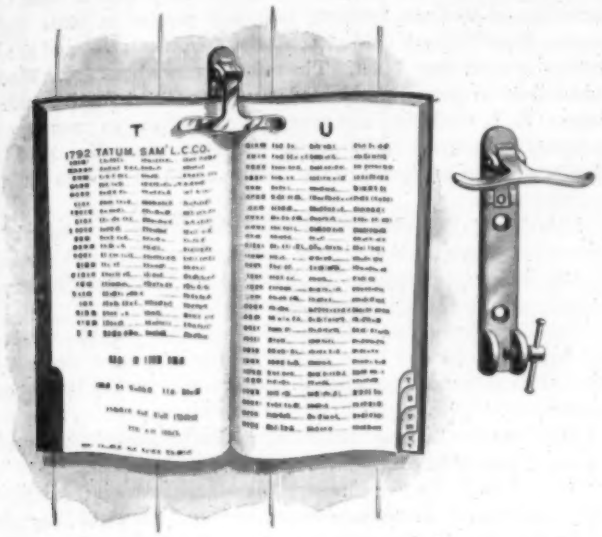


grinding. The height of the machine set up is three feet. Any grade of emery is furnished for the grinding wheel. The company manufactures a variety of emery wheels, ranging from the coarse and hard No. 1, designed for edging cast iron or steel, for taking gates and sprues off castings, and for general rough grinding, to the fine, soft, No. 5, suitable for fine grinding on brass or other soft metals and for polishing and other surface work on iron and steel. It is used largely for sharpening tools.

THE Garrett-Cromwell Engineering Co., of Cleveland, has taken a contract to build a conveyor 500 feet long, for conveying billets at the plant of the Alabama Steel & Shipbuilding Co., at Ensley, Ala. The conveyor is of the contracting company's special type. It is driven by a wire cable instead of employing gear.

TELEPHONE BOOK HOLDER.

One of the specialites of the Samuel C. Tatum Co., of Cincinnati, is a telephone book-holder, of which a cut is given below. It holds the book securely in an upright position, so that the pages may be easily turned. There is a spring clamp at the top. The device does away with the annoyance and



loss of time caused by the passing of a number from the memory while waiting for the exchange to respond, or by reason of some interruption.

The New Canadian Steel Co.

A meeting was held at Montreal, Que., June 22, attended by H. M. Whitney, of Boston, president of the Dominion Coal Co., and by a number of prominent Canadian capitalists, resulting in the formation of a steel company to be known as the Dominion Steel & Smelting Co. There will be $15,000,000 of stock and it is proposed to issue $8,000,000 of 5 per cent 30-year gold bonds, of which $2,000,000 will be retained in the treasury. It is expected that Canadians will subscribe for $5,000,000 of the stock. The board of directors consists of H. M. Whitney, H. F. Dimock, and Almeric H. Paget, of Boston; Sir W. Van Horn, R. B. Angus, James Ross and Robert Mackay, of Montreal; George Cox, and Elias Rogers, of Toronto, and D. McKean, Michael Dwyer, F. B. Pearson, and W. B. Ross, of Halifax, N. S. H. M. Whitney, of Boston, is president; R. B. Angus, of Montreal, vice-president; J. S. McLennan, Montreal, secretary; B. F. Pearson, Halifax, treasurer. The company plans to erect steel works at Sydney, Cape Breton, Nova Scotia. A site has been selected, but it is given out that operations await the outcome of the bounty legislation now before the Dominion Parliament. The coal company is largely interested in the project. A portion of the ores will be obtained from Newfoundland, the harbor at Louisburg being open the year round.

Julian Kennedy, of Pittsburg, is consulting engineer to the company. The Riter-Conley Co., of Pittsburg, has the blast furnace contract in hand. It is expected that three or four furnaces will be built.

D. B. MEACHAM, of Rogers, Brown & Co., Cincinnati, is quoted in a Cincinnati paper on a curious transaction in pig iron. His firm bought last week 1,000 tons of iron at the market price from an investor to whom Rogers, Brown & Co., sold the identical iron in 1886. The man had held it all the intervening years, and then sold it for practically what he had given for it in 1886. In the meantime, however, he had seen it go down year after year. Mr. Meacham said: "The incident serves rather to illustrate how low iron has been than the height to which prices have now risen. Iron is still advancing, however, and no one can say where prices will be before the increase stops."

THE semi-annual meeting af the National Founders' Association will be held at the International Hotel, Niagara Falls, August 8 and 9.

INDUSTRIAL SUMMARY.

[If you are in need of machinery of any description, please notify *The Iron Trade Review*, and we will put you in communication with our advertisers at once.]

New Buyers in the Market, and Some of Their Wants:—

L. H. Rumage, of Osborne, Saeger & Co., Cleveland, desires to purchase a second-hand bolt cutter. It must be in first-class condition and cut from ⅜ to 1¼ inches.

H. C. Chapman, Chesterfield, S. C., is in the market for two 25 h. p. center-crank engines, three 15 h. p. center-crank engines, two 30 h. p. return tubular boilers and three 20 h. p. return tubular boilers, new or second-hand.

The Ellwood Lawn Mower Mfg. Co. was organized at Ellwood, Ind., with A. H. Hopper, treasurer and I. W. Gregg, secretary.

Franklin Foundry Co., Chicago, has been incorporated, capital stock, $11,000, by Ralph L. Wayman, William Street and H. A. Wayman.

Hoisting equipment.—W. J. Lowrance, Morgan City, La., wants hoisting outfit for unloading boats (20-foot hoist); second-hand will do.

The Mayfield Weather Strip Co., Carthage, Mo., will buy small lever punches for punching screw and tack holes in metal.

S. Rafsnydier, Axemann, Center Co., Pa., will purchase second-hand machinery as follows: One shaper, 12 or 18 inches; one lathe, 12-inch swing by 5 foot bed; one emery water grinder; one 50-pound power hammer; one Wells Bros. bolt cutter; one milling machine; one power hack saw; one combination cut and rip saw; one turret lathe, 2x24.

New Construction:—

The new gray iron foundry of Clinton Burnham at Milwaukee, Wis., will be put in operation early in July. One difficulty experienced has been in getting iron. The cost of the plant is $10,000. From 75 to 100 men will be employed.

The Industrial Works, of Bay City, Mich., are to erect a new building for boiler shop and erection purposes, the works being now overcrowded. The vacation of a street by the city council is asked, that the improvement may be made.

At Lorain O., the American Ship Building Co. has let contracts for a number of additional buildings, including the following: An addition of 130x50 feet to the store-room and receiving room, 30 feet addition to the joiner shop, an addition of 30x50 feet to the machine shop and a rivet building 100x30 feet. The company will also put in the power house, an engine and air compressor much larger than the the present machine and the rivet building will be fitted out with rivet and bolt making machines. A number of new machines will also be placed in the joiner and machine shops.

Alex. Adamson's foundry & machine shop at Akron, O., will be enlarged by a 50x100 foot brick building, of two stories, which will double the capacity of the plant.

The new machine shop of the Fosdick & Holloway Machine Tool Co., in Cumminsville, Cincinnati, will be finished about Sept. 1. It is 239x97 feet and of brick. The equipment and arrangement are thoroughly modern. About 500 men will be employed. Four shower baths, in addition to regular lavatories and other conveniences will be provided for the men.

At Manhattan, Kan., the regents of the State Agricultural College are receiving bids for an extension to the machine shops, to cost $16,000. The capacity of the shops will be doubled and the new buildings will include blacksmith shop, foundry, testing laboratory, steam fitting shop, brass foundry, and an additional machine shop.

The American Steel Casting Co. is planning to erect a new building and to add one more furnace to its plant at Sharon, Pa.

New Castle, Ind., is negotiating for the location of a steam shovel works, in which Grant Wiggins, of Richmond, Ind., and J H. Smith, of Rhode Island, are interested. A committee of citizens is working for the project in an effort to raise $20,000.

Foundations for a new tin mill are being laid at Lisbon, O., making a 7-mill plant.

Taylor & Son, Springfield, O., have started work upon a new foundry, 70x350 feet.

The West Virginia Steel Co., of which F. G. Caldwell, of the Caldwell & Peterson Mfg. Co., Wheeling, W. Va., is presi-

dent, is reported to have selected a location within the city limits of Wheeling for its new plant. The company has purchased 12 acres of land.

The Schiffler Bridge Co., Pittsburg, will build a two-story brick machine shop and office, 80.9 by 224.2¼ and 247.6 feet, for Williamson Bros. & Co., Philadelphia.

At Springfield, O., the Springfie'd Machine Tool Co. has three new buildings under way—50x50 feet, 50x235½ feet, and 50x216½ feet.

At East York, Pa., Geo. W. Mundorf is building a new hame and chain works.

The board of trade, Youngstown, O., has received an offer from the Ingersoll Milling Machine Co., Rockford, Ill., to locate a plant in Youngstown It is reported that three acres of ground have been given and that a sum of money will be raised to remove the works.

The McCormick Harvesting Machine Co., Chicago, has bought property on Blue Island ave., 250x100 feet, and on Oakley ave., 86x350 feet for $60,000.

Plans are being made at Chester, Pa., for the erection of a large plate mill. Capt. W. S McManus and others interested in the Chester Tube & Pipe Co., are connected with the project.

Work has begun on an addition to the Saco and Pettee machine shops at Newton Upper Fall, Mass.

The Missouri Malleable Iron Co., East St. Louis, Mo., has decided to enlarge its plant, increasing its capacity one-third. About 250 additional men will be used.

The Kilbourne & Jacobs Mfg. Co., of Columbus, O., and the Jeffrey Mfg. Co., also of Columbus, have purchased ground joining their works, and will erect considerable additions.

It is now stated that the Alabama Steel & Wire Co., will invest $1 500,000 in its new plant at Ensley, Ala., or about 50 per cent more than was originally intended.

Fires and Accidents:—

The foundry and machine shops of the Birmingham (Ala.) Foundry & Machine Co., were destroyed by fire June 22, with the exception of the new foundry building. The loss is estimated at $200,000, insurance $50,000. The plant was the most extensive in the Birmingham district.

Power Equipment and Machine Tools:—

The Westinghouse Electric & Mfg. Co. has recently closed a contract with the Honululu Iron Works Co. for an electrical equipment for its factories, to be shipped forthwith to the Hawaiian Islands. The contract comprises a 150 kilowatt 250 volt compound wound Westinghouse generator, to be belted to a steam engine, driving the generator at 550 revolutions per minute. A marble switchboard will be provided with the latest devices for manipulating the electrical apparatus. There will also be shipped some Westinghouse electric motors for operating planing and drilling machines.

The Niles Tool Works, Hamilton, O., recently shipped 35 cases of machine tools to August Brucke & Co., of Antwerp, Belgium. The shipment included a big lot of pulleys, manufactured by the American Pulley Co., Philadelphia.

General Manager McNaughton, of the Chapin Mining Company, Iron Mountain, Mich., has let the contract for an incandescent electric system for the lighting of the property underground, on the surface, and numerous buildings. The generator will be a 120 kw. machine, with a capacity for furnishing between 2,000 and 2,400 sixteen candle power lights. The motor is to be 175 h. p. The power for operating the machinery will be furnished by a Leffell & Co. water wheel. All the machinery will be located at Hydraulic Falls. It is estimated that the loss of power in the transmission from the falls to the mine will be less than 5 per cent.

Westinghouse, Church, Kerr & Co., have sold three steam engines to the China Eastern Railway. These engines will be built at once by the Westinghouse Machine Co., East Pittsburg, and shipped via San Francisco. They are the usual Westinghouse enclosed type adapted for operating electric dynamos.

R. S. Newbold & Sons Co., Norristown, Pa., have received an order from Thysen & Co., Mulheim, Rhenish Prussia, for a Newbold patent rotary shear and circle cutter to cut boiler heads 11 feet in diameter and 1 inch thick—the largest the company has built. The largest rotary shears previously cut a circle 10 feet 6 inches. Several are in use—one each in the works of the Carnegie Steel Co., Illinois Steel Co., Carbon Steel Co.

General Industrial Notes:—

The Ironton, O., *Register* notes these facts concerning the iron industry in that district: The Wellston Iron & Steel Co. have leased Madison furnace, and will put it in blast right away. Etna furnace sold 18,000 tons of iron at 11.50 and $14.00 before it went into blast. The price is now about $20. Bloom and Olive furnaces have joined the column of active industries. E. J. Bird, Sr., has accepted a position as manager of a furnace syndicate in Virginia. Sarah furnace has sold its year's product of metal to the Ashland Steel Works at the market price.

The Edgar Foundry, of Mobile, Ala., has purchased at Memphis, Tenn., the complete outfit of patterns and castings of the Wooldridge Stove Co. The Edgar Foundry will change its name to the Mobile Stove Works.

The Enterprise Boiler Co., of Youngstown, O., has received an order for four hot blast stoves for the National Steel Co., for the new furnace construction projected by the latter company.

The Passaic Rolling Mill Co., of Patterson, N. J., expects to erect four additional basic open-hearth furnaces.

Wm. Tod & Co., engineers, founders and machinists, of Yonugsotwn, O., have received a contract from the Carnegie Steel Co., Ltd., for one 30-inch hydraulic shear.

At New Britain, Conn., 160 molders in the Russell & Irwin foundry went out on a strike last week for higher wages.

Newberry Furnace (charcoal) at Newberry, Mich., has been sold to Eastern parties, together with tracts of timber land.

The Biehien Foundry & Machine Co.'s plant at St. Joseph, Mo., was closed by creditors June 17. Liabilities $20,000; assets, $15,000.

At Parryville, Pa., the Carbon Iron & Steel Co., has increased wages 10 cents a day, beginning July 1.

The Cambria Steel Co., Johnston, Pa., has given notice of a general advance of 10 per cent in wages. About 85,000 men are affected.

The Waterworks Commissioners of Cincinnati have rejected the bids for cast iron pipe recently opened, on the ground that they were excessive. The United States Cast Iron Pipe & Foundry Co. bid $240,069, and the Camden Iron Works $215,959. The latter company provided that certain sizes of pipe were not to be tested, and the bid was therefor thrown out as irregular.

Application has been made for a charter for the Pine Iron Works Co., Joseph L. Bailey, of Pine, Pa., president, and, Joseph Bailey, of Harrisburg, treasurer. The new company will begin the manufacture of iron in a few weeks, using the old mill, located at Glendale, one mile from Pine, five miles northwest of Pottstown. It was on this site that Poole forge was erected in 1713, and in 1716 iron was shipped from this place to England.

The Republic Iron & Steel Co. will erect, it is reported, two new furnaces on its Pioneer properties, in the Birmingham district, instead of one.

Charles H. Besly & Co., 10 and 12 N. Canal st., Chicago, have been directing special attention to their mannocitin, or rust preventive, for machinery, engines, tools, guns, cycles and all metals. Mannocitin is composed of greases and volatile oils. It remains neutral, and contains no acid. On application the oils evaporate, leaving an air-tight film or skin, which adheres to the metal and permanently prevents rust and corrosion. It withstands salt air, salt water, rain, snow, dampness, perspiration, steam, gases and fumes of acids and ammonia. For 10 cents in stamps a sample package is sent, and a booklet on Mannocitin is mailed on application. The company's new 1899 catalogue is now ready for distribution, and is mailed free.

At Kenosha, Wis., Wells & Meissier have leased the Peter Lippert machine shops for a term of five years, from July 1. It is one of the largest works in the city and gives them much needed facilities.

W. J. Carlin, of Allegheny, is preparing to operate the Premier Steel Works, of Indianapolis, Ind., which he recently

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Harrison Safety Boiler Works,

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purchased. The plant consists of two open-hearth and two Bessemer furnaces; a blooming mill, beam mill, rail mill, muck bar mill, and sheet mill; also a foundry. The blooming mill will be put to work immediately on billets and blooms, which will be made into sheet bars.

It is understood that the Republic Iron & Steel Co. has definitely decided not to rebuild Phoenix furnace of the Brown-Bonnell Iron Co. plant, Younsgtown, O.

At North Tonawanda, N. Y., the Tonawanda Iron & Steel Co. has made an increase of 10 per cent in wages. One furnace, recently out for relining, is ready to start.

The McKenna plant for the re-working of old steel rails, Joliet, Ill., has started up with a well-filled order book. About 125 men are at work.

The new blooming mill at the plant of the Lorain Steel Co., Lorain, O., has been started up.

A Massillon, O., dispatch says that the Massillon Bridge Co.'s stockholders have rejected the offer of the proposed bridge consolidation on the ground that the cash payment is not sufficient

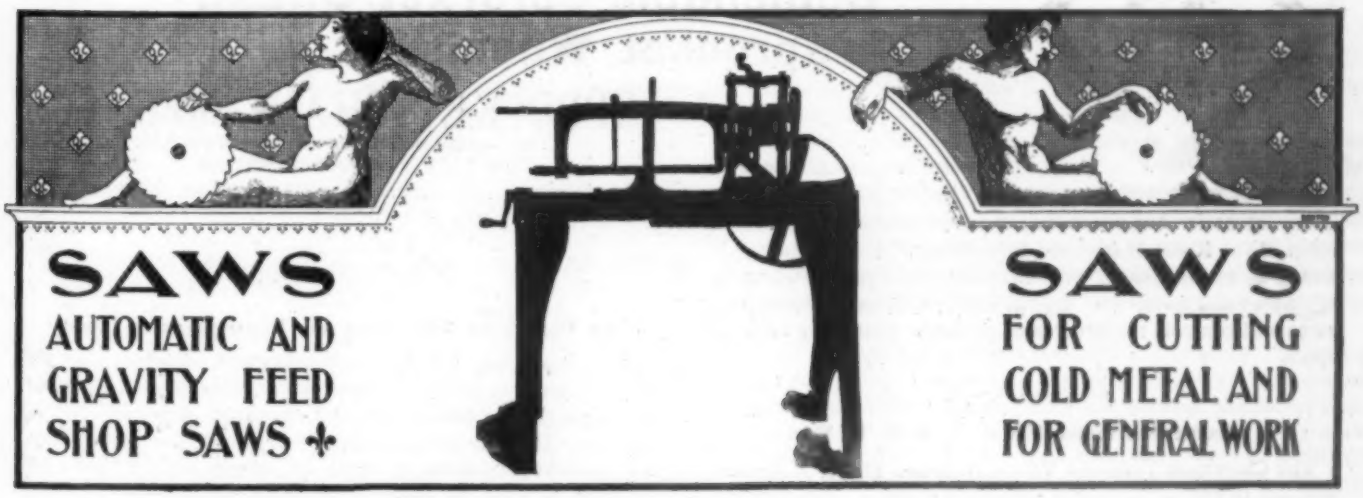
Hubbert & Hubbert, Monadnock Bldg., Chicago, have purchased an interest in the Champion Iron & Steel Co., Muskegon, Mich., owner of the rolling mill formerly operated by the Muskegon Iron & Steel Co. The works are now turning out open-hearth steel and bar iron.

The Pottsville (Pa.) Iron & Steel Co.'s plant is to be sold by the receiver on July 15.

The Cleveland Ball & Screw Co., of Cleveland, is rapidly becoming an important factor in the steel ball manufacturing business. The company's machine shop, which is furnished with modern tools, has been busy for the past year on a line of automatic machines for its own use. These are of an original design, calculated to make the highest class of steel balls, at lowest cost of labor, and with practically no loss of material by waste. The work of F. Schulze, superintendent, L. F. Schulze, mechanical engineer, and Robert R. Schulze, designer, has resulted in the production of a complete scheme for turning out rapidly in large quantities both cut and forged balls, in size from 1-16 to 4 inches, while machines will be built later to produce balls up to 6 inches. The company has also perfected an automatic screw machine calculated to turn out fine work in machine and other classes of steel screws. This will be put on the market in the coming fall. By addition of the line of ball machines now nearing completion the company expects to double its capacity within a few weeks, putting it in a position to guarantee prompt deliveries on new orders. Present orders for agricultural concerns are important, aggregating about eight tons. Large orders for 3-inch and 4-inch balls were closed recently. The company has been working mainly on the larger sized balls, but is now in position to produce small sizes, for bicycle and other uses. A recent shipment of 7,000 1¼-inch balls was made to an Eastern concern.

A Monterey, Mex., dispatch says that a company has been organized there with a capital of $10,000,000 gold to erect mammoth steel works. The principal stockholders are Mexican capitalists, the heirs of the late banker, Patricio Millmo, subscribing $1,000,000 to the enterprise. There is iron ore near Monterey and coal lands near at hand.

The United States Enameled Brick Co., chartered June 19, held a meeting of stockholders in the office of the Reese-Hammond Fire Brick Co., Bolivar, Pa., on June 24, and elected the following board of directors: J. B. Hammond, E. R. Hammond, B. F. Reese, Leonard Roden, all of Bolivar, Pa., and J. B. Sommerville, of Wheeling, W. Va. The following officers were elected: J. B. Hammond, president; B. F. Reese, vice-president; W. M. Wynn, secretary; E. R. Hammond, treasurer, and Leonard Roden, general manager. It



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The date of the excursion, Aug. 10th, is the most convenient for an outing. Business is quiet at this season, crops are gathered, and office, store and farm duties are not exacting. The thermometer usually reaches the highest point about this time. It will be a pleasing diversion to spend a week's vacation in the invigorating ocean breeze and experience the unlimited pleasures at the command of the summer idler by the sea.

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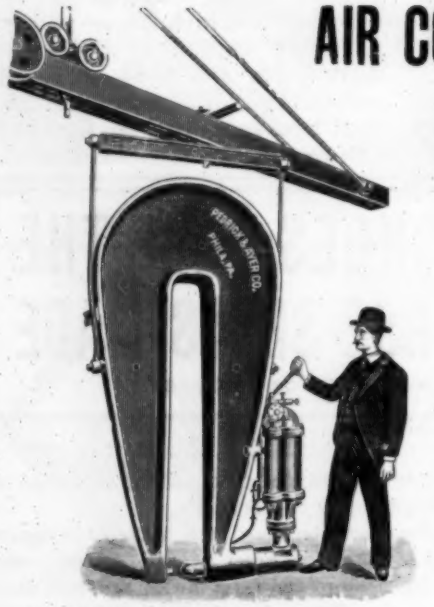

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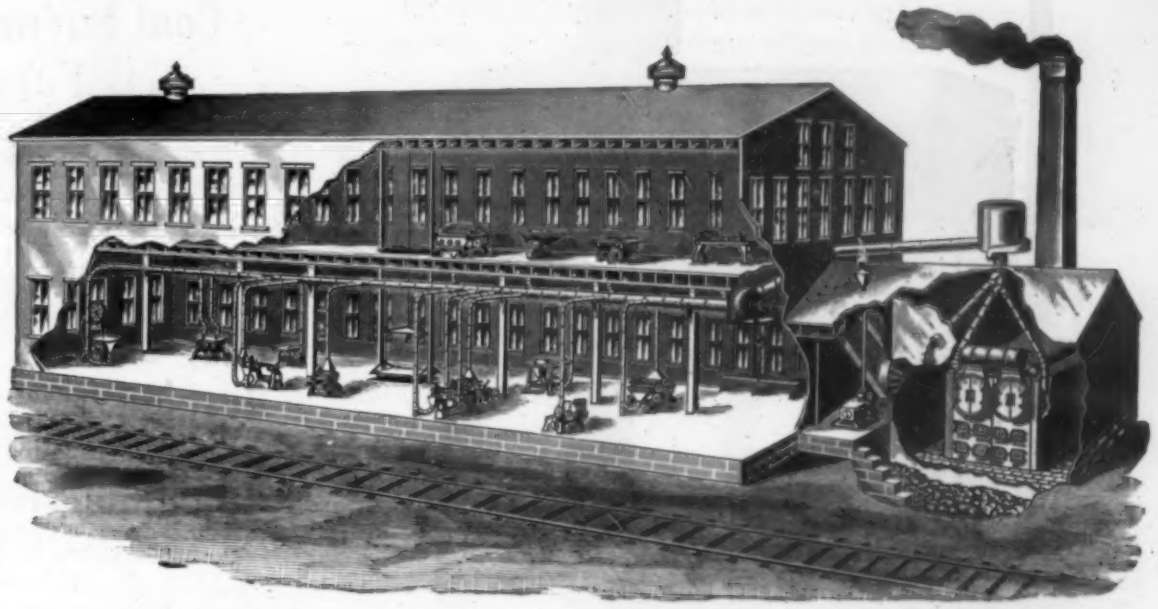

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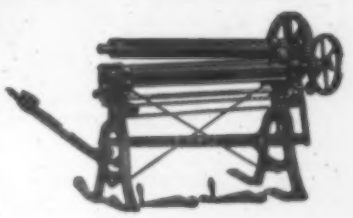

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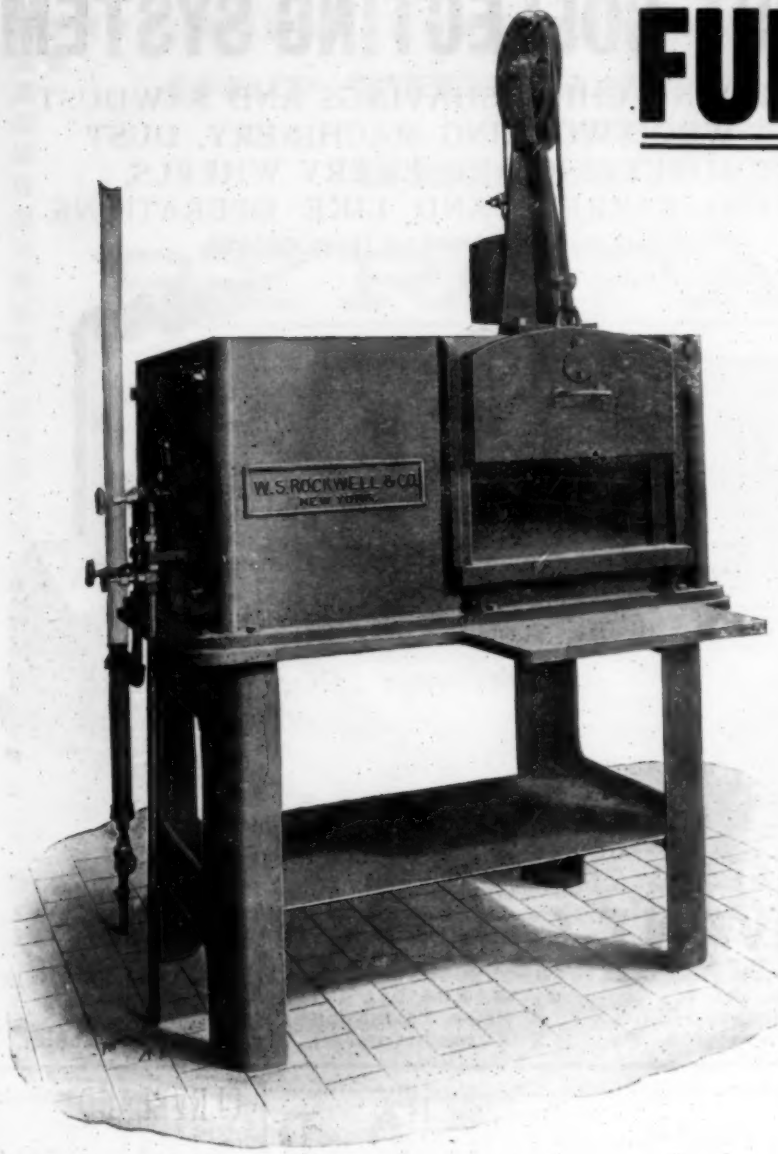

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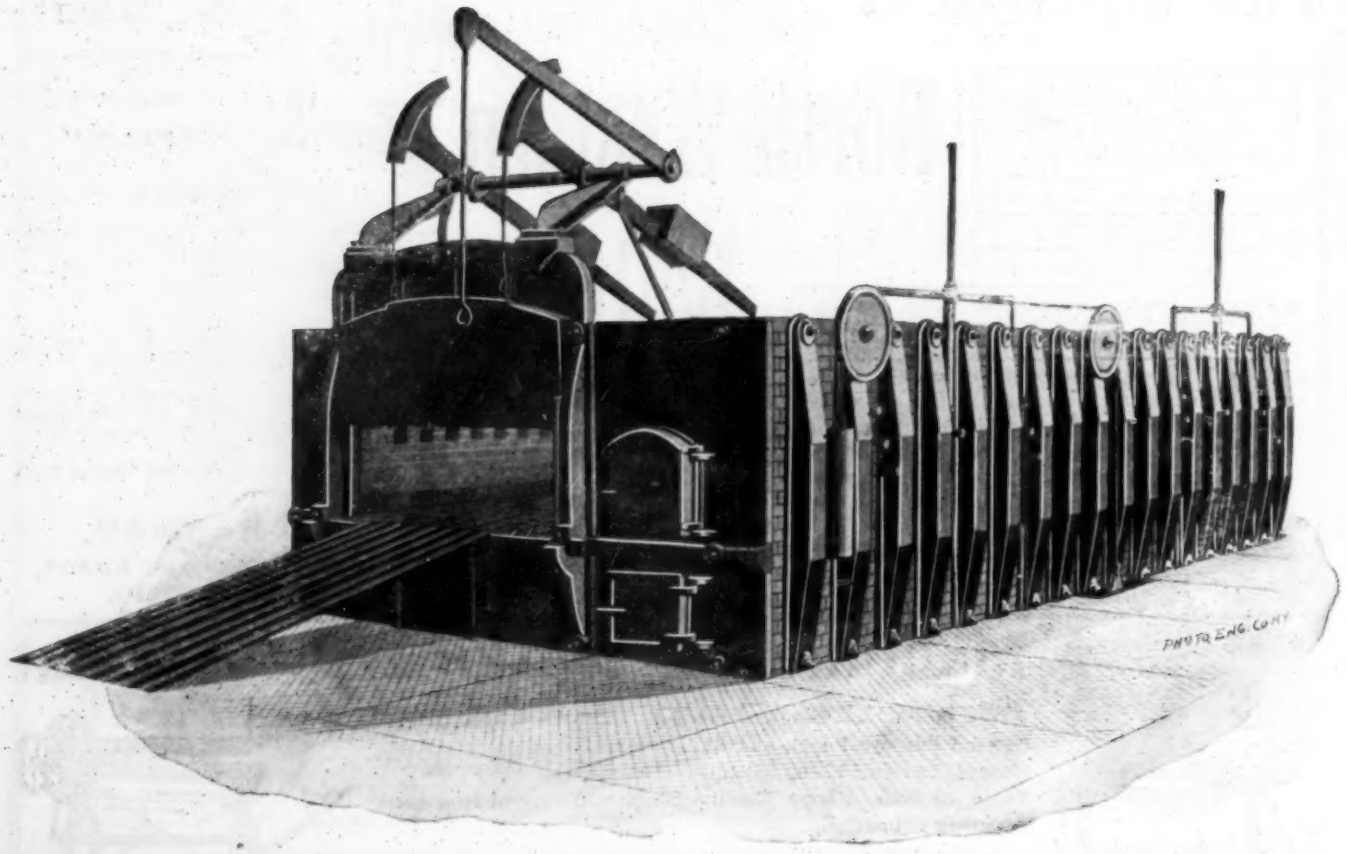

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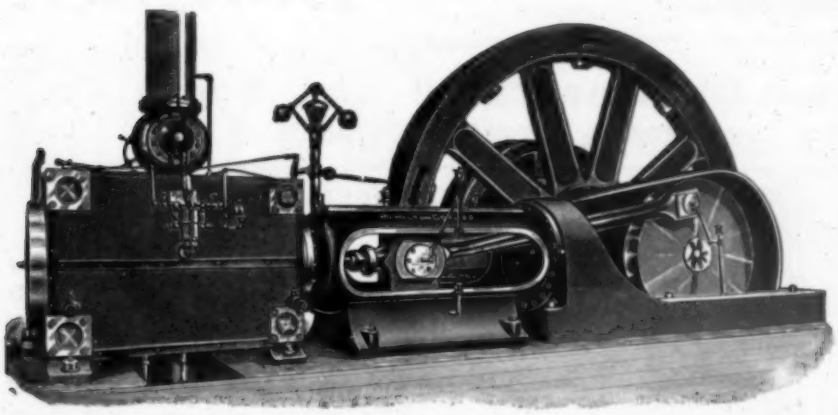

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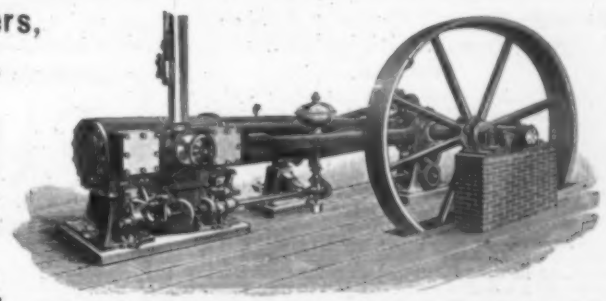

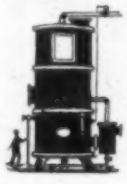

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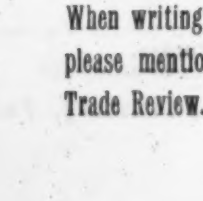

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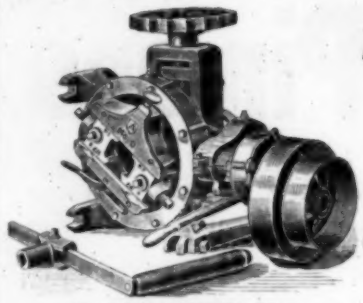

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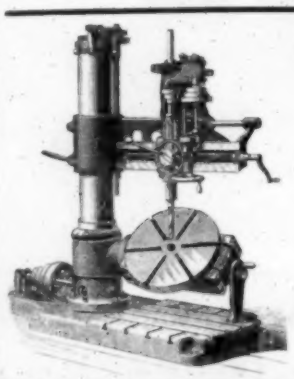

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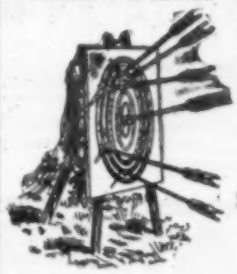

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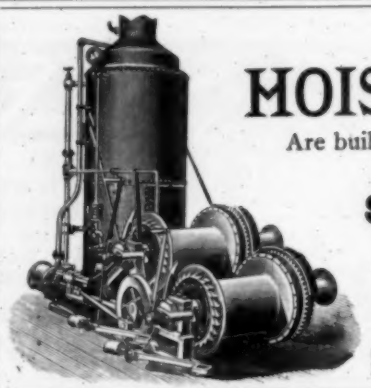

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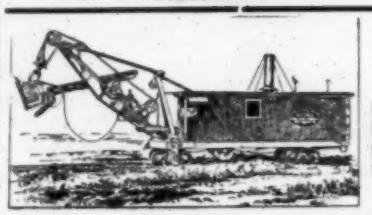

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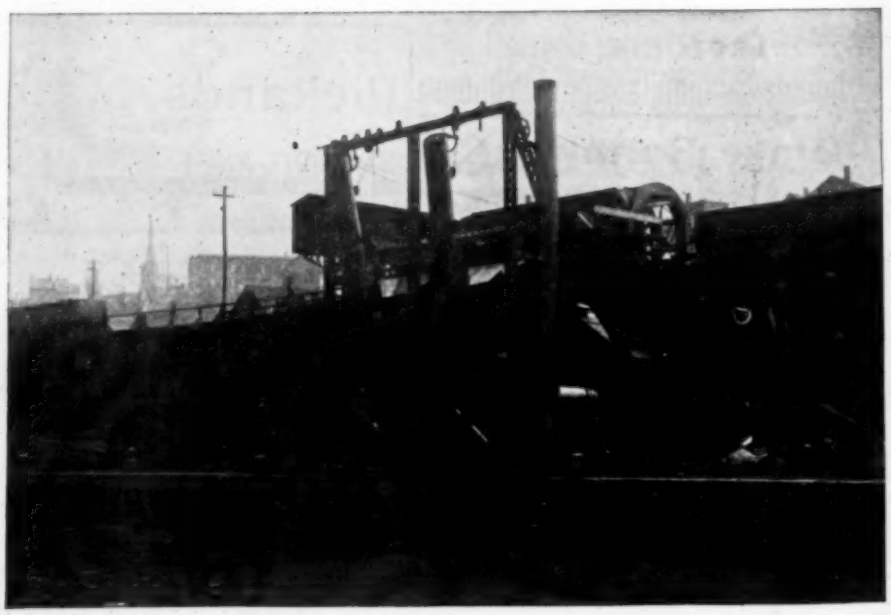

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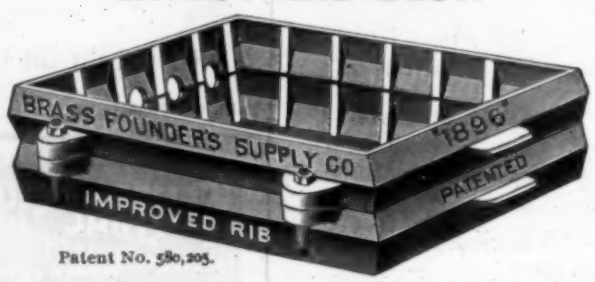

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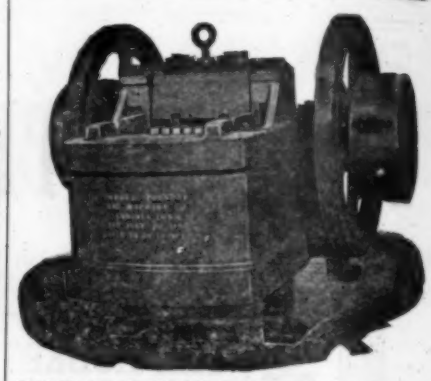

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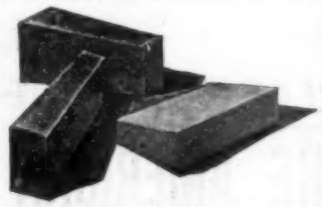

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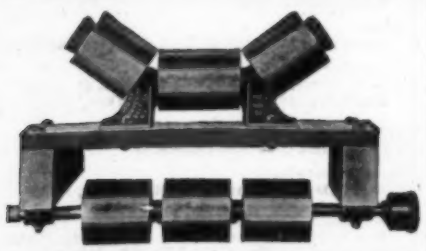

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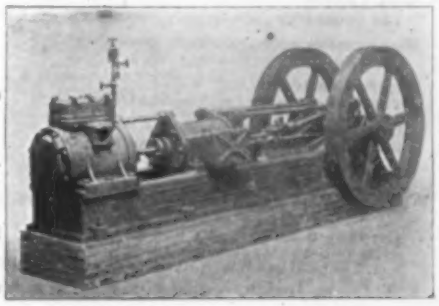

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Covert Mfg. Co., West Troy, N. Y.

Hoists—
Edwin Harrington Son & Co., Philadelphia.
Reading Crane & Hoist Works, Reading, Pa.
The Lane & Bodley Co., Cincinnati, O.
The Aultman Co., Canton, O.
Lidgerwood Mfg. Co., New York City.

Heaters and Purifiers—
Harrison Safety Boiler Works, Philadelphia.
James Bonar & Co., Pittsburg, Pa.
We Fu Go Co., Cincinnati, O.
Austin Separator Co., Detroit, Mich.

Heating and Ventilating Apparatus
B. F. Sturtevant Co., Boston.

Heavy Hardware—
C. H. Besly & Co., Chicago, Ill.
Parkhurst & Wilkinson Co., Chicago, Ill.

Hoisting Engines—
The Edward P. Allis Co., Milwaukee, Wis.
Earle C. Bacon, New York City.
The Lane & Bodley Co., Cincinnati, O.
Lidgerwood Mfg. Co., New York City.
The Aultman Co., Canton, O.
Webster, Camp & Lane Machine Co., Akron, O.
Excelsior Iron Works Co., Cleveland, O.

Hoisting Machinery—
Link-Belt Machinery Co., Chicago, Ill.
Reading Crane & Hoist Works, Reading, Pa.
Jeffrey Mfg. Co., Columbus, O.
The Lane & Bodley Co., Cincinnati, O.
Excelsior Iron Works Co., Cleveland, O.
Earl C. Bacon, New York City.
Lidgerwood Mfg. Co. New York City.
Heyl & Patterson, Pittsburg, Pa.
The Aultman Co., Canton, O.
The Brown Hoisting and Conveying Machine Co., Cleveland, O.
Webster, Camp & Lane Machine Co., Akron, O.
Robins Conveying Belt Co., New York City.

Horse Shoes—
Phoenix Horse Shoe Co., Joliett, Ill.

Hotels—
United States Hotel Co., Cleveland, O.

Hydraulic Machinery—
Stilwell-Bierce & Smith-Vaile Co., Dayton, O.

Impulse Cleaners—
Union Boiler Tube Cleaner Co., Pittsburg, Pa.

Ingot Molds—
Lorain Foundry Co., Lorain, O.

Injectors—
C. H. Besly & Co., Chicago, Ill.
Manning, Maxwell & Moore, New York City.
James Bonar & Co., Pittsburg, Pa.

Insurance Companies—
Hartford Steam Boiler I. & I. Co., Hartford, Ct.

Iron Buildings—
Shiffler Bridge Co., Pittsburg, Pa
Riter-Conley Co., Pittsburg, Pa.

Iron Nails and Steel—
Bethlehem Iron Co., South Bethlehem, Pa.
C. H. Besly & Co., Chicago, Ill.
E. H. Stroud & Co., Chicago, Ill.
Parkhurst & Wilkinson Co., Chicago, Ill.

Iron and Steel Roofing—
Berger Mfg. Co., Canton, O.
Ætna-Standard Iron & Steel Co., Bridgeport, O.

Iron Ore—
Lake Superior Consolidated Iron Mines New York City, N. Y.
Oglebay, Norton & Co., Cleveland, O.
M. A. Hanna & Co., Cleveland, O.
Drake Bartow & Co., Cleveland, O.
Pickands, Mather & Co., Cleveland, O.

Iron Working Tools—
H. Bickford, Lakeport, N. H
C. H. Besly & Co., Chicago, Ill.
The F. B. Shuster Co., New Haven, Conn.
U. Baird Machinery Co., Pittsburg, Pa.
Fox Machine Co., Grand Rapids, Mich.
Armstrong Bros. Tool Co., Chicago, Ill.
The Armstrong Mfg. Co., Bridgeport, Conn.
Bickford Drill & Tool Co., Cincinnati, O.
Skinner Chuck Co., New Britain, Conn.
Cleveland Tool & Supply Co., Cleveland, O.
Brainard Milling Machine Co., Hyde Park, Mass.
Baush & Harris Machine Tool Co., Springfield, Mass.
Danielson Machine & Tool Co., Cleveland, O.
Manning, Maxwell & Moore, New York City.
Cleveland Ball & Screw Co., Cleveland, O.
W. P. Davis Machine Co., Rochester, N. Y.

Link Belting—
The Jeffrey Mfg. Co., Columbus, O.
Link-Belt Machinery Co., Chicago, Ill.
Heyl & Patterson, Pittsburg, Pa.
The Aultman Co., Canton, O.

Ladles—
The S. Obermayer Co., Cincinnati, O.

Lathes—
W. P. Davis Machine Co., Rochester, N. Y.
U. Baird Machinery Co., Pittsburg, Pa.
Bickford Drill & Tool Co., Cincinnati, O.
Danielson Machine & Tool Co., Cleveland, O.
Manning, Maxwell & Moore, New York City.

Lubricators—
A. F. Boettcher, Rowlands, Pa.

Machinery Name Plates—
August Becker, Boston, Mass.

Machinists' Tools and Supplies—
W. P. Davis Machine Co., Rochester, N. Y.
H. Bickford, Lakeport, N. H.
C. H. Besly & Co., Chicago, Ill.
U. Baird Machinery Co., Pittsburg, Pa.
Bertsch & Co., Cambridge City, Ind.
Fox Machine Co., Grand Rapids, Mich.
Armstrong Bros. Tool Co., Chicago, Ill.
Bickford Drill & Tool Co., Cincinnati, O.
Parkhurst & Wilkinson Co., Chicago, Ill.
Skinner Chuck Co., New Britain, Conn.
Cleveland Tool & Supply Co., Cleveland, O.
Baush & Harris Machine Tool Co., Springfield, Mass.
Danielson Machine & Tool Co., Cleveland, O.
Manning, Maxwell & Moore, New York City.
Western Mfg. Co , Springfield, O.

Machine Screws—
C. H. Besly & Co., Chicago, Ill.

Machine Shops—
The R. D. Nuttall Co., Allegheny, Pa.
The Lane & Bodley Co., Cincinnati, O.
H. A. Streeter, Chicago, Ill.

Machinery and Tool Steel—
C. H. Besley & Co., Chicago, Ill.
Bræburn Steel Co., Bræburn, Pa.
Crescent Steel Co., Pittsburg, Pa.
La Belle Steel Co., Pittsburg, Pa
Sanderson Bros. Steel Co., Cleveland, O.
Byron H. White, Chicago, Ill.
Morris & Bailey Steel Co., Pittsburg, Pa.

Magnesia Covering—
C. H. Besly & Co., Chicago, Ill.

Malleable Castings—
Acme Malleable Iron Works, Buffalo, N. Y.

Manufacturing Chemists.
We Fu Go Co., Cincinnati, O.

Manufactured Iron & Steel—
Bourne-Fuller & Co., Cleveland, O.
Cleveland Rolling Mill Co., Cleveland, O.
Ætna-Standard Iron & Steel Co., Bridgeport, O.
The Morris & Bailey Steel Co., Pittsburg, Pa.
Parkhurst & Wilkinson Co., Chicago, Ill.
Ohio Steel Co., Youngstown, O.

Metal Bearings—
C. H. Besly & Co., Chicago, Ill.
Perfect Lubricating Metal Co., Cincinnati, O.
Merchant & Co., Inc., Philadelphia, Pa.
Swarts Metal Refining Co., Chicago, Ills.
F. R. Phillips' Sons Co., Philadelphia, Pa.
Henry L. Schwarzenberg, Cleveland, O.

Milling Machines—
W. P. Davis Machine Co., Rochester, N. Y.
U. Baird Machinery Co., Pittsburg, Pa.
Fox Machine Co., Grand Rapids, Mich.
Brainard Milling Machine Co., Hyde Park, Mass
Danielson Machine & Tool Co., Cleveland, O.
Manning, Maxwell & Moore, NewYrok City.

Mining Machinery—
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Earle C. Bacon, New York City.
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Jeffrey Mfg. Co., Columbus, O.
Lidgerwood Mfg. Co., New York City.
Wm. Cramp & Sons, Philadelphia, Pa.
The Bucyrus Co., South Milwaukee, Wis.
Marion Steam Shovel Co., Marion, O.
Webster, Camp & Lane Machine Co., Akron, O.
Fraser & Chalmers, Chicago, Ill.
Robins Conveying Belt Co., New York City.
Excelsior Iron Works Co., Cleveland, O.

Mine Pumps—
F. M. Prescott Steam Pump Co., Milwaukee, Wis.

Molding Machines—
Tabor Mfg. Co., Elisabeth, N. J.

Molding Sand—
Ohio Sand Co., Conneaut, O.
F. B. Stevens, Detroit, Mich.
Garden City Sand Co., Chicago, Ill.
Newport Sand Bank Co., Newport, Ky.

Name Plates—
August Becker, Boston, Mass.

Nickel Plating Outfits—
Northampton Emery Wheel Co., Chicago, Ill.

Nuts and Bolts
Upson Nut Co., Cleveland, O.

Oilless Bearings—
C. H. Besly & Co., Chicago, Ill.

Oil Burners—
W. S. Rockwell & Co., New York City.

Oil Cups—
C. H. Besly & Co., Chicago, Ill.
James Bonar & Co., Pittsburg, Pa.
Oil Filters—
James Bonar & Co., Pittsburg, Pa.
Oil Pumps—
C. H. Besly & Co., Chicago, Ill.
Oil Separators—
Harrison Safety Boiler Works, Philadelphia, Pa.
Austin Separator Co., Detroit, Mich.
Ore Crushers—
The Edward P. Allis Co., Milwaukee, Wis.
Jeffrey Mfg. Co., Columbus, O.
The Aultman Co., Canton, O.
Fraser & Chalmers, Chicago, Ill.
Ore Screens—
Rob't Aitchison Per. Metal Co., Chicago, Ill.
Harrington & King Per. Co., Chicago, Ill.
The Aultman Co., Canton, O.
Fraser & Chalmers, Chicago, Ill.
Packing—
C. H. Besly & Co., Chicago, Ill.
Jenkins Bros., New York City.
Paint—
Iron Clad Paint Co., Cleveland, O.
Jos. Dixon Crucible Co., Jersey City, N. J.
Standard Paint Co., New York, City.
The Shearer-Peters Paint Co., Cincinnati, O.
Pattern Works—
Gobeille Pattern Co., Cleveland, O.
Perforated Sheet Metal—
Harrington & King Perforating Co., Chicago, Ill
Aitchison Perforated Metal Co., Chicago, Ill.
Fraser & Chalmers, Chicago, Ill.
Pig Iron—
Clinton Iron & Steel Co., Pittsburg.
Forster, Waterbury & Co., Chicago, Ill.
Bourne-Fuller Co. Cleveland, O.
M. A. Hanna & Co., Cleveland, O.
E. H. Stroud & Co., Chicago, Ill.
F. B. Stevens, Detroit, Mich.
McKeefrey & Co., Leetonia, O.
Superior Charcoal Iron Co., Grand Rapids, Mich
Spearman Iron Co., Sharpsville, Pa.
The Brier Hill Coal & Iron Co., Youngstown, O.
Pickands, Mather & Co., Cleveland, O.
Pipe Cleaners—
Union Boiler Tube Cleaner Co., Pittsburg, Pa.
Pipe Covering—
C. H. Besly & Co., Chicago, Ill.
Jenkins Bros., New York City.
Pipe Cutting and Threading Machines—
The Armstrong Mfg. Co., Bridgeport, Conn.
Planers—
W. P. Davis Machine Co., Rochester, N. Y.
U. Baird Machinery Co., Pittsburg, Pa.
Bickford Drill & Tool Co., Cincinnati, O.
Danielson Machine & Tool Co., Cleveland, O
Manning, Maxwell & Moore, New York City.
Plates—
Enterprise Boiler Co., Youngstown, O.
Plumbers' and Gas Fitters' Supplies—
C. H. Besly & Co., Chicago, Ill.
Pneumatic Appliances—
Clayton Air Compressor Works, New York.
Pneumatic Tools.—
American Pneumatic Tool Co., New York City
Q & C Co., Chicago. Ill.
Portable Forge—
C. H. Besly & Co., Chicago, Ill.
B. F. Sturtevant Co., Boston, Mass.
Vulcan Mfg. Co., Pittsburg, Pa.
Power Drop Hammers—
Baush & Harris Machine Tool Co., Springfield Mass.
Power Presses—
Bertsch & Co., Cambridge City, Ind.
Fox Machine Co., Grand Rapids, Mich.
E. Konigslow & Bro. Cleveland, O.
Danielson Machine & Tool Co., Cleveland, O.
Power Transmission Machinery—
Jeffrey Mfg. Co., Columbus, O.
The Lane & Bodley Co., Cincinnati, O.
E. A. Delano, Chicago. Ill.
Dodge Mfg. Co., Mishawaka, Ind.
The Aultman Co., Canton, O.
Jones & Laughlins, Ltd., Pittsburg, Pa.
I. & E. Greenwald Co., Cincinnati, O.
Presses—
Bertsch & Co., Cambridge City, Ind.
C. H. Besly & Co., Chicago, Ill.
E. Konigslow & Bro. Cleveland, O.
Danielson Machine & Tool Co., Cleveland, O.
Pressure Gauges—
The Bristol Co., Waterbury, Conn.
James Bonar & Co., Pittsburg, Pa.
Pulleys—
W. A. Jones Foundry Co., Chicago, Ill.
The Lane & Bodley Co., Cincinnati, O.
E. A. Delano, Chicago, Ill.
Dodge Mfg. Co., Mishawaka, Ind.
The Aultman Co., Canton, O.
Jeffrey Mfg. Co., Columbus, O.
Jones & Laughlins, Ltd., Pittsburg, Pa
I. & E. Greenwald Co., Cincinnati, O.
Pumps (Steam)—
The Edward P. Allis Co., Milwaukee, Wis
Blakeslee Mfg. Co., Du Quoin, Ill.
Fred M. Prescott Steam Pump Co., Milwaukee Wis.
Hall Steam Pump Co., Pittsburg, Pa.
Southwark Foundry & Machine Co., Philadelphia, Pa.
Punches—
E. Konigslow & Bro. Cleveland, O.
Pyrometers—
Edward Brown, Philadelphia, Pa.
Vulcan Mfg. Co., Pittsburg, Pa.
Railway Supplies—
Cleveland City Forge & Iron Co., Cleveland, O.
Garden City Sand Co., Chicago, Ill.
Rivets—
Champion Rivet Co., Cleveland, O.
Jonse & Laughlins, Ltd., Pittsburg, Pa.
Riveted Steel Pipe—
The Wm. B. Pollock Co. Youngstown, O.
Rock Drills—
Rand Drill Co., Chicago, Ill.
The Ingersoll-Sergeant Drill Co., New York.
Rolling Mill Machinery.
Totten & Hogg Iron and Steel Foundry Co., Pittsburg, Pa.
F. R. Phillips' Sons Co., Philadelphia, Pa.
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Shiffler Bridge Co., Pittsburg.
Riter-Conley Mfg. Co., Pittsburg, Pa.
Sand and Chill Rolls—
Seaman, Sleeth Co., Pittsburg, Pa.
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Peter Gerlach & Co., Cleveland, O.
Screens for Coal Ore, Etc.
Robt. Aitchison Perforated Metal Co., Chicago.
Harrington & King Perforating Co., Chicago.
Jeffrey Mfg. Co., Columbus, O.
The Aultman Co., Canton, O.
Fraser & Chalmers, Chicago, Ill.
Screws—
C. H. Besly & Co., Chicago, Ill.
Upson Nut Co., Cleveland, O.
Chicago Screw Co., Chicago, Ill
Screw Machines—
Cleveland Ball & Screw Co., Cleveland, O.
Seamless Tubes—
Shelby Steel Tube Co., Cleveland, O.
Separators—
Harrison Safety Boiler Works, Philadelphia, Pa.
Austin Separator Co., Detroit, Mich.
Shafting—
The Lane & Bodley Co., Cincinnati, O.
E. A. Delano, Chicago, Ill.
Dodge Mfg. Co., Mishawaka, Ind.
Pitzsimmons & Co., Cleveland, O.
The Aultman Co., Canton, O.
Jeffrey Mfg. Co., Columbus, O.
Jones & Laughlins, Ltd., Pittsburg, Pa
I. & E. Greenwald Co., Cincinnati, O.
Shapers—
W. P. Davis Machine Co., Rochester, N. Y.
Baush & Harris Machine Tool Co., Springfield, Mass.
Fox Machine Co., Grand Rapids, Mich.
Shearing and Punching Machinery—
Bertsch & Co., Cambridge City, Ind.
Fox Machine Co., Grand Rapids, Mich.
Danielson Machine & Tool Co., Cleveland, O.
Sheet Iron—
Cleveland Rolling Mill Co., Cleveland, O.
Ætna-Standard Iron & Steel Co., Bridgeport, O.
E. H. Stroud & Co., Chicago, Ill.
Ship Yards—
Wm. Cramp & Sons, Philadelphia, Pa.
Special Machinery—
Edwin Harrington Son & Co., Philadelphia.
Q & C Co., Chicago, Ill.
The Aultman Co., Canton, O.
Jeffrey Mfg. Co., Columbus, O.
E. Konigslow & Bro. Cleveland, O.
Wheeling Mold & Foundry Co., Wheeling, W. Va.
Danielson Machine & Tool Co., Cleveland, O.
Stand Pipes—
The Wm. B. Pollock Co., Youngstown, O.
Steam Boiler Inspectors—
Hartford Steam Boiler Inspection & Insurance Co., Hartford, Conn.
Steam Pipe and Boiler Covering—
C. H. Besly & Co., Chicago Ill.
Steam Packing—
C. H. Besly & Co., Chicago, Ill.
Steam Pumps—
Hall Steam Pump Co., Pittsburg, Pa.
Stilwell-Bierce & Smith-Vail Co., Dayton, O.
Blakeslee Mfg. Co., Du Quoin, Ill.
Fred. M. Prescott Steam Pump Co., Milwaukee, Wis.
Edw. P. Allis Co., Milwaukee, Wis.
Southwark Foundry and Machine Co., Philadelphia, Pa.
James Bonar & Co., Pittsburg, Pa.
Steam Separators—
James Bonar & Co., Pittsburg, Pa.
Austin Separator Co., Detroit, Mich.
Harrison Safety Boiler Works, Philadelphia, Pa.
Steam Shovels and Dredges—
Marion Steam Shovel Co., Marion, O.
The Bucyrus Co., South Milwaukee, Wis.
Steam Specialties—
C. H. Besly & Co., Chicago, Ill.
James Bonar & Co., Pittsburg, Pa.
Steel—
Otis Steel Co., Cleveland, O.
E. H. Stroud & Co., Chicago, Ill.
Bræburn Steel Co., Bræburn, Pa.
Crescent Steel Co., Pittsburg, Pa.
La Belle Steel Co., Pittsburg, Pa.
The Morris & Bailey Steel Co., Pittsburg, Pa.
Sanderson Bros. Steel Co., Cleveland, O.
Byron H. White, Chicago, Ill.
Steel Balls—
Cleveland Ball & Screw Co., Cleveland, O.
Steel Castings—
Otis Steel Co., Cleveland, O.
Q & C Co., Chicago, Ill.
Steel Plants—
The Wm. B. Pollock Co., Youngstown, O.
The Riter-Conley Co., Pittsburg, Pa.
Steel Blooms and Billets—
Cleveland Rolling Mill Co., Cleveland.
Bethlehem Iron Co., South Bethlehem, Pa.
Ohio Steel Co., Youngstown, Ohio.
The Lorain Steel Co., Lorain, O.
Jones & Laughlins, Ltd., Pittsburg, Pa.
Steel Stamps and Stencils—
J. H. Fleharty & Co., Cleveland, O.
Steel Tubes—
Shelby Steel Tube Co., Cleveland, O.
Stokers—
Playford Stoker Co., Cleveland, O.
Tanks—
Enterprise Boiler Co., Youngstown, O.
Meehan Boiler & Construction Co., Lowellville, Ohio.
The Wm. B. Pollock Co., Youngstown, O.
Riter-Conley Mfg. Co., Pittsburg, Pa.
The Aultman Co., Canton, O.
Tank Cars—
The Wm. B. Pollock Co., Youngstown, O.
Tin and Terne Plates—
E. H. Stroud & Co., Chicago, Ill.
American Tin Plate Company, Chicago, Ill.
Tin Plate Machinery.
Totten & Hogg Iron and Steel Foundry Co., Pittsburg, Pa.
F. R. Phillips' Sons Co., Philadelphia, Pa.
Tool Steel—
C. H. Besly & Co., Chicago, Ill.
Bræburn Steel Co., Bræburn, Pa.
Crescent Steel Co., Pittsburg, Pa.
La Belle Steel Co., Pittsburg, Pa.
Sanderson Bros. Steel Co., Cleveland, O.
Transmission Machinery—
Heyl & Patterson, Pittsburg, Pa.
Link-Belt Machinery Co., Chicago, Ill.
The Lane & Bodley Co., Cincinnati, O.
W. A. Jones Foundry & Machine Co., Chicago, Ill
Jeffrey Mfg. Co., Columbus, O.
Dodge Mfg. Co., Mishawaka, Ind.
The Aultman Co., Canton, O.
Brown Hoisting and Conveying Machine Co., Cleveland, Ohio.
Tubes—
National Tube Works, McKeesport, Pa.
Shelby Steel Tube Co., Cleveland, O.
Tube Cleaners—
Union Boiler Tube Cleaner Co., Pittsburg, Pa.
Tube Welding—
S. Fix Sons, Cleveland, O.
Tumbling Mills—
The S. Obermayer Co., Cincinnati, O.
Turnbuckles—
Cleveland City Forge & Iron Co., Cleveland, O.
Twist Drills—
C. H. Besly & Co., Chicago, Ill.
Twist Drill Cases—
Vulcan Mfg. Co., Pittsburg, Pa.
Valves—
C. H. Besly & Co., Chicago, Ill.
Jenkins Bros., New York City.
Manning, Maxwell & Moore, New York City.
James Bonar & Co, Pittsburg, Pa.
Ventilating Fans—
B. F. Sturtevant Co., Boston Mass.
Vises—
Massey Vise Co., Chicago, Ill.
Water Softening Plants—
We Fu Go Co., Cincinnati, O.
Wire Coating—
The Ironsides Company, Columbus, O.
Wire Filler—
The Ironsides Company, Columbus, O.
Wire Machinery—
The F. B. Shuster Co., New Haven, Conn.
S. W. Goodyear, Waterbury, Conn.
Wire Nails—
Cleveland Rolling Mill Co., Cleveland, O.
Wire Rope Coating —
The Ironsides Company, Columbus, O.
Wire Rope Filling—
The Ironsides Company, Columbus, O.
Wood Pulleys—
Dodge Mfg. Co., Mishawaka, Ind.
Wrought Pipe—
National Tube Works, McKeesport, Pa.

Alphabetical List of Advertisers.

The star (*) indicates that the adv. appears alternate weeks; the dagger (†) once a month; the double dagger (‡) once in three weeks; the parallel (‖) three times out of four.

	PAGE
Acme Malleable Iron Works	2
Ætna-Standard Iron & Steel Co	39
Ætna Fire Brick Co	32
Aitchison, Rob't, Perforated Metal Co	31
Allis & Co., Edward P	39
*American Pneumatic Tool Co	31
American Tin Plate Company	41
Apollo Iron & Steel Co	1
Armstrong Bros. Tool Co	1
Armstrong Mfg. Co	28
Aultman Co	2
Austin Separator Co	43
Bacon, Earle C	32
Bachman, D. I	29
Baird Machinery Co	23
Baush & Harris Machine Tool Co	44
Becker, August	1
*Berger Mfg. Co	—
*Bertsch & Co	25
Besly & Co., Chas. H	44
Bethlehem Iron Co	34
*Bickford Drill & Tool Co	26
Bickford, H	44
Blakeslee Mfg. Co	1
Boettcher, A. F	29
Bonar & Co., James	27
Bourne-Fuller Co	1-2
Bræburn Steel Co	37
Brainard Milling Machine Co	28
Brass Founders' Supply Co	32
Brier Hill Iron & Coal Co	23
Bristol Co., The	1
Britton & Co., J. Blodgett	2
*Brown, Edward	—
Brown Hoisting and Conveying Machine Co	30
Bucyrus Co	30
Cahall Sales Department	1
Central Electrotype & Engraving Co	31
*Champion Rivet Co	—
Chicago Fire Clay Product Co	32
Chicago & Northwestern Ry	25
Chicago Press Clipping Bureau	23
*Chicago Rawhide Mfg. Co	35
Chicago Screw Co	1
Clayton Air Compressor Works	2
Clearfield Fire Brick Co	32
Cleveland Ball & Screw Co	28
Cleveland City Forge & Iron Co	1
†Cleveland Facing Mill Co	28
Cleveland Rolling Mill Co	29
Cleveland Tool & Supply Co	28
Clinton Iron & Steel Co	29
Cleveland & Buffalo Transit Co	25
*C. M. & St. P. Ry	—
Cole, J. Wendell	44
Covert Mfg. Co	31
Cramp & Sons, Wm	40
Cremer & Bicknell	31
Crescent Steel Co	37

Darlington Machine & Tool Co. 44
W. P. Davis Machine Co. 28
Delano, E. A. 29
Detroit & Cleveland Navigation Co 42
Dickman & MacKenzie 2
Dixon Jos., Crucible Co. 40
*Dodge Mfg Co. 25
Dover Fire Brick Co. 32
Drake, Bartow & Co. 29
Emmerton, F. A. 2
Enterprise Boiler Co. 1
Erikson, Edward E. 23
Excelsior Iron Works Co. 30
Fitzsimons & Co. 37
*Fix Sons 21
Fleharty, J. H. & Co. 43
Forster, Waterbury & Co. 1
Fox Machine Co. 33
Fraser & Chalmers 31
Frick Coke Co., H. C. 1
Gandy Belting Co. 44
Garden City Sand Co. 32
Gerlach, Peter & Co. 37
Gobeille Pattern Co. 37
Goodyear, S. W. 28
Greenwald Co., I. & E. 27
Hall Steam Pump Co. 33
Hanna & Co., M. A. 29
Harrington & King Perforating Co. 1
Harrison Safety Boiler Works. 21
Hartford Steam Boiler Insp. & Ins. Co 28
Heyl & Patterson 30
Holmes, Strachan & Co. 32
Hooven, Owens & Rentschler Co. 27
Hunt Robt. W., & Co. 2
Illinois Central R. R. —
Ingersoll-Sergeant Drill Co. 2
Iron Clad Paint Co. 40
Ironsides Co. 22
Jeffrey Mfg. Co. 30
Jenkins Bros 40
Jones & Co., John T. 2
Jones Foundry & Machine Co., W. A. 1
Jones & Laughlins, Ltd. 41
Kentucky Fire Brick Works 23
Konigslow & Bro., E. 28
La Belle Steel Co 37
Lake Superior Consolidated Iron Mines 29
Lane & Bodley 39
Laughlin & Co., Alex 31
Lidgerwood Mfg Co. 30
Link-Belt Machinery Co. 30
Lorain Foundry Co 42
Lorain Steel Co. 41
Lusch, H. B. 43
Mason, Samuel R. 28
Main Belting Co. 33
Manning, Maxwell & Moore 24
Marion Steam Shovel Co. 44
McKeefrey & Co. 29
Meehan Boiler & Construction Co. 1
Merchant & Co. 38
Millers Falls Co. 44
Millett Core Oven Co. 3-32
Mitchell, Samuel 44
†Modern Machinery, —
Morris & Bailey Steel Co. 37
*National Engraving Co. 38
National Tube Works Co. 43
†Newport Sand Bank Co. —
Northampton Emery Wheel Co. 38
Nuttall Co. The R. D. 27
Oak Hill Fire Brick & Coal Co. 23
Oglebay, Norton & Co. 29
†Ohio Sand Co. —
Ohio Steel Co. 29
Otis Steel Co. 23
†Parkhurst & Wilkinson Co. —
Perfect Lubricating Metal Co. 44
Phillips' Sons Co., P. H. 1-42
Phœnix Horse Shoe Co. 23
Pickands, Mather & Co. 29
Playford Stoker Co. 40
Pollock, The Wm. B. Co 2
Prescott Steam Pump Co. 33
Q & C Co. 21
Rand Drill Co. 2
Reading Crane & Hoist Works 30
Riter-Conley Mfg. Co. 31
Riverside Foundry Co. 22
Robins Conveying Belt Co. 31
*Rockwell & Co., W. S. —
Ryan, J. J. & Co. 33
Sanderson Bros. Steel Co. 37
Seaman, Sleeth Co. 42
Sennett Co., Geo. B. 39
Shwarzenberg, Henry L. 22
Scioto Star Fire Brick Works. 32
‡Sharon Fire Brick Works. 1
Sheaffer-Peters Paint Co. 34
Shelby Steel Tube Co. 2
Shiffler Bridge Co 31
Shuster, The F. B., Co. 28
Skinner Chuck Co. 28
Southwark Foundry and Machine Co. 39
Spearman Iron Co. 44
Sprocket Chain Mfg. Co. 22
Standard Paint Co. 33
Stevens, F. B. 26-44
Streeter, H. A. 2
Stroud & Co., R. H. 2
Sturtevant Co., B. F. 35
*Superior Charcoal Iron Co 26
Swarts Metal Refining Co. 1
Tabor Mfg Co. 32
Textor, O. 2
Tod, Wm. & Co. 39
Totten & Hogg Iron and Steel Foundry Co. 42
Union Mining Co 22
Union Boiler Tube Cleaner Co. 1
United States Hotel Co. 40
Upson Nut Co. 1
Van Dorn & Dutton Co. 37
Vulcan Mfg. Co. 31
Washington Coal and Coke Co. 33
Western Mfg. Co. 1
Webster, Camp & Lane Machine Co. 23
Webster Fire Brick Co. 1
We Fu Go Co. 31
Wheeling Mold & Foundry Co. 44
White, Byron H. 37
Wyman & Gordon 43

BRÆBURN STEEL COMPANY, Bræburn, Pa.
MANUFACTURERS OF
FINE TOOL STEEL AND FORGINGS. ALSO SPRING HAMMER, AND MACHINERY STEEL OF HIGH QUALITY. FINE OPEN-HEARTH STEEL.
DIRECTORS: Wm. Metcalf, Chas. Metcalf, P. B. Hasbrouck, R. P. Kelly, Sec'y. and Treas.

MORE WEAR from your tools
.....Almost no **STEEL EXPENSE**
NO TROUBLE
"It pays to use the most reliable tool steel in the market."
SANDERSON BROS. STEEL CO.
Cleveland Warehouse, 97 Water St.

CRESCENT STEEL
ESTABLISHED 1865 ✱ INCORPORATED 1888.
CRESCENT STEEL CO.
480 PEARL ST. NEW YORK — PITTSBURGH, PA. — 64 & 66 S. CLINTON ST. CHICAGO.

La BELLE STEEL CO., Pittsburgh, Pa.
MANUFACTURERS OF FINE
CRUCIBLE CAST TOOL STEEL.
SPECIAL GRADES FOR ALL PURPOSES.
BYRON H. WHITE,
Western Selling Agent.
OFFICE AND WAREHOUSE: **68 and 70 South Canal St., Chicago.**

BYRON H. WHITE, Western Selling Agent,
68-70 South Canal St., Chicago.

THE MORRIS & BAILEY STEEL CO. PITTSBURG, PA.
COLD ROLLED STRIP STEEL
FLAT & COILED FOR STAMPING BLANKING DRAWING SPRINGS ETC
BYRON H WHITE
WESTERN SELLING AGENT
68 70 S. CANAL ST. CHICAGO
BYRON H. WHITE, Western Selling Agent, CHICAGO.

Don't Waste Money in Your Pattern Shop.
THE GOBEILLE PATTERN CO., Cleveland.

FOUR-NIGHT.

Cleveland Union Station.
Pennsylvania Lines.
Foot of Bank Street.
TICKET OFFICES at Station, Euclid Av., Woodland Av., and Weddell House corner.
THROUGH TRAINS RUN AS FOLLOWS BY CENTRAL TIME
*Daily. †Daily except Sunday
xDaily except Saturday. ‡Saturdays only.

FROM CLEVELAND TO	LEAVE	ARRIVE
Pittsburgh and Bellaire	† 7:00 am	†12:10 pm
Salem and Pittsburg	* 8:00 am	* 8:30 pm
Pittsburgh, Bellaire and East	† 3:15 pm	† 6:25 pm
Philadelphia and New York	* 2:10 pm	*11:30 am
Baltimore and Washington	* 2:10 pm	*11:30 am
Alliance and Pittsburgh	* 2:10 pm	*11:30 am
Ravenna and Alliance	* 5:00 pm	* 8:45 am
Philadelphia and New York	*11:10 pm	* 4:30 am
Baltimore and Washington	*11:10 pm	* 4:30 am
Alliance and Pittsburgh	*11:10 pm	* 4:30 am

Mt. Vernon and Pan-Handle Route

FROM CLEVELAND TO	LEAVE	ARRIVE
Columbus and Cincinnati	* 8:35 am	* 5:40 pm
Indianapolis and St. L.	* 8:35 am	* 5:40 pm
Millersburg and Akron	† 3:15 pm	†12:10 pm
Col., Cin., Ind. & St. L.	x7:40 pm	*7:30 am

The Chemical Analysis of Iron.

A Complete Account of all the best-known Methods for the Analysis of Iron, Steel, Pig Iron, Iron Ore, Lime-stone, Slag, Clay, Sand, Coal, Coke, and Furnace and Producer Gas. By ANDREW ALEXANDER BLAIR. **New (Third) Edition.** Illustrated. 8vo. Half Morocco, $4.

The reputation which this book has won for itself in the estimation of analytical chemists will be increased by the many improvements in the **Third Edition.**

Sent postpaid on receipt of price by
THE IRON TRADE REVIEW CO.,
27 Vincent St., Cleveland, O.

PETER GERLACH & CO.,
MAKERS OF
Saws Tools and Machinery
Office and Warerooms, 28 Columbus St.
Factories on Columbus, Winter and Leonard Sts.
Cleveland, Ohio, U. S. A.

BABBITT METALS

All standard and special grades.
In sectional molds or bars.

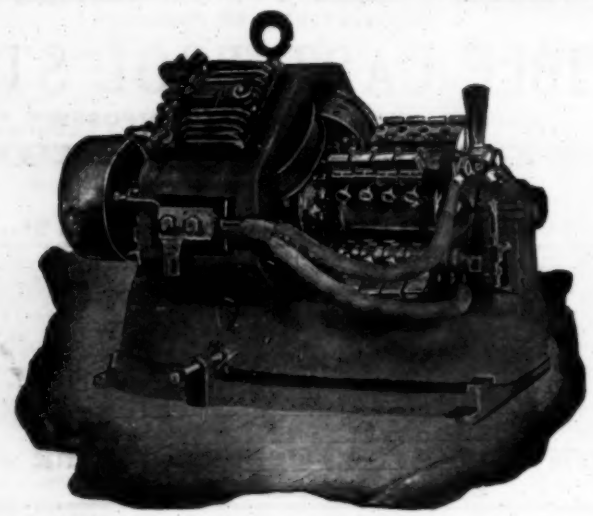
Phila. Chicago. **MERCHANT & CO., Inc.** New York. Brooklyn

Wrtte us for prices always. It will pay you.

Eddy Dynamo Electro-Plating Machines

— FOR —

BICYCLE PLATING PLANTS.



NORTHAMPTON EMERY WHEEL CO., 20 S. Canal St., Chicago, Ill

EXCLUSIVE WESTERN SELLING AGENTS.

Leviathan Belting.

Tested under the hardest possible conditions and proved by years of service to be the best belt

For Heavy Driving of All Kinds.

Proof against Heat Steam and Water.
Strength Durability, and Traction Power Unequalled.

SOLE MANUFACTURERS,

MAIN BELTING CO.

1219-1235 Carpenter St., PHILADELPHIA.
55 and 57 Market St., CHICAGO.
120 Pearl St., BOSTON.

Send for Price Lists and Samples

RAWHIDE BELTING

And Lace Leather.

— ALSO —

Rawhide Rope, Pinions, Picker Leather, Halters, Bell and Register Cord, and other Rawhide Goods of all kinds.

THE MABBS HYDRAULIC RAWHIDE PACKING.

CHICAGO RAWHIDE MFG. CO., 75-77 Ohio St., CHICAGO, ILL

Advertisers who "keep everlastingly at it" win success.
That is the testimony of the shrewdest and livest of them.

IRON AND STEEL MARKETS.

IRON ORE.

[On Lake Erie Docks.]

Special low-phosphorous hard ore, Bessemer		$4 50
No. 1 Specular, Bessemer	$3.50@	4.25
No. 1 Bessemer, hematite	3.00@	4 05
Hematites No. 1 non-Bessemer	2.25@	2.70
No. 1 Specular, non-Bessemer	2.50@	.75
Mesabi Bessemer	2 50@	3.00

PIG IRON.

Cleveland (f. o. b. cars):		
Bessemer		$18.65
No 1 Strong Foundry	$17 75@	18.75
No. 2 Strong Foundry	17.25@	18 25
Gray Forge, red short	16 00@	16.50
No. 1 American Scotch	1 75@	18.75
No 2 American Scotch	17.50@	18.50
Lake Superior Charcoal	19.00@	20.00
PITTSBURG.		
No. 1 Foundry	17.50@	18.00
No. 2 Foundry	17 2 @	17 75
Gray Forge	17.00@	17 25
Warm Blast Charcoal	17.25@	17.75
Cold Blast Charcoal	16.75@	17.25
Bessemer	19.75@	20.00
CHICAGO:		
Lake Superior Charcoal	$20.50@	23 00
Local Coke Foundry No. 1	19 00@	19.50
Local Coke Foundry No 2	18.50@	19.00
Local Coke Foundry No. 3	18 00@	18.50
Local Scotch Foundry No. 1	19 00@	19.50
Local Scotch Foundry No. 2	18.50@	19.00
Local Scotch Foundry No. 3	18 00@	18.50
Southern Coke No. 1	18.50@	19.50
Southern Coke No. 2	18.00@	18.50
Southern Coke No. 3	17.50@	18 00
Southern No. 1 Soft	18.50@	19.00
Southern No. 2 Soft	18.00@	18 50
Southern Silveries	18.00@	18.25
Jackson Co. Silveries	22.50@	23.00
Ohio Silveries No. 1	@	
Ohio Strong Softeners	20.0 @	21.00
Alabama Car Wheel	19 50@	20.00
Malleable Bessemer	19.00@	19 50
Coke Bessemer	20.00@	20.50
CINCINNATI (reported by Rodgers, Brown & Co.)		
Southern Coke, No. 1 F'dry	$17.50@	18.00
" " No. 2 "	17 25@	17.50
" " No. 3 "	16.25@	16.50
" " No. 4 & G. E.	15.75@	16 00
" " Mottled	15.75@	16.00
" " No. 1 Soft	177.50@	18.00
" " No. 2 "	17.25@	17.50
Lake Superior Coke, No. 1	19 00@	19.50
Lake Superior Coke, No. 2	18.50@	19.00
Hanging Rock Charcoal No. 1	21.00@	22.00
Jackson Co. Silvery, No. 1	22.00@	23.00
Standard Georgia Car Wheel	18.25@	19.00
Lake Superior Charcoal	21 50@	2.200
BUFFALO:		
No. 1 Foundry Strong Coke Iron Lake Superior Ore	18.00@	19.00
No 2 Foundry Strong Coke Iron Lake Superior Ore	18.25@	18.75
Ohio Strong Softener No. 1		19.50
Ohio Strong Softener No. 2		19.00
Jackson Co. Silvery No. 1		22.00
Southern Soft No. 1		20.00
Southern Soft No. 2		19.50
Lake Superior Charcoal	19.00@	20.00
Coke, Malleable	18.50@	19.00
ST. LOUIS:		
Southern Coke No. 1		16.75
Southern Coke No. 2		16.25
Southern Coke No. 3		15.75
Southern Coke No 4		15.50
Southern Gray Forge		15.25
Tennessee Charcoal No. 1	15.50@	16.50
Jackson County 8 per cent silicon	18 00@	18.50
Lake Superior Coke No. 1	17.50@	18.00
Southern Car Wheel	17.00@	17.50

OLD RAILS AND SCRAP METAL.

[Delivered Cleveland.]	Gross Tons.
Old iron rails	$20.00
Old steel rails (6 ft. and over)	15.00
Old steel rails (6 ft. and under)	15.00
Old car wheels	16.00
	Net Tons.
No. 1 R. R. wrought scrap	$16.50
Mill scrap	11 50
No 1 Machine cast scrap	13.00
Iron axles	19 00
Axle turnings	11.00
Wrought turnings (free from cast)	10.00
Cast borings	9.00
Uncut wrought iron boilers	7 00
Steel boiler plates	11.00
Grate bars	8 00
Pipes and flues (clean)	10.00
Tank Iron	12.00
Hoop and band iron	9.00
Sheet iron	8.00
Wrought drillings	10 00
Malleable iron	10.50

STRUCTURAL MATERIAL.

Beams and channels (f. o. b. Cleveland)		1 85c
Angles	1.85@	1 95c
Tees		1.90c
Universal plates	2.25@	2.50c
Sheared plates		2 4 c

MERCHANT IRON AND STEEL.

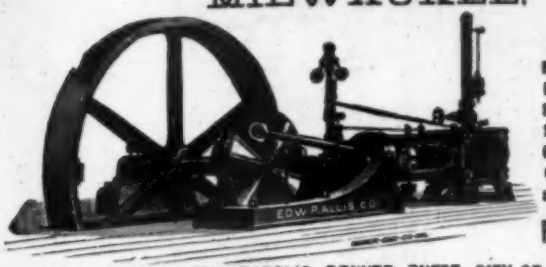
[Less than car-lots, Cleveland.]

Rounds and Squares—Bar Iron.

1 to 1⅞	1.85 Base.
2 to 2⅞	.20 extra.
3 to 3½	.50 "
3⅝ to 4	.80 "
4⅛ to 4½	1.00 "
4⅝ to 5	1.30 "
5⅛ to 6	1.10 "
6⅛ to 6½	2.20 "

THE EDWARD P. ALLIS COMPANY

MILWAUKEE, WIS.



MANUFACTURERS OF

Blowing Engines, Hoisting Engines, Pumping Engines Air Compressors, Special Engines for Electric Lighting Street Railways and Rolling Mills, Ore Crushers, Crushing Rolls, Stamp Mills Concentrators, General Mining Milling and Smelting Machinery.

Reynolds Corliss Engines.

NEW YORK. CHICAGO. MINNEAPOLIS. DENVER. BUTTE. CITY OF MEXICO. SAN FRANCISCO. PITTSBURG

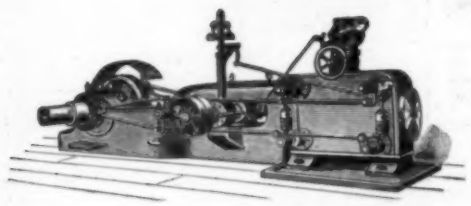
Southwark Foundry & Machine Co.

PHILADELPHIA, PA.

Porter-Allen Automatic Engines,
Blowing Engines, Centrifugal Pumps,
Weiss Counter-Current Condensers.

THE LANE & BODLEY CO.,

CINCINNATI, OHIO.



Engines,

ALL SIZES.

Simple and Compound.

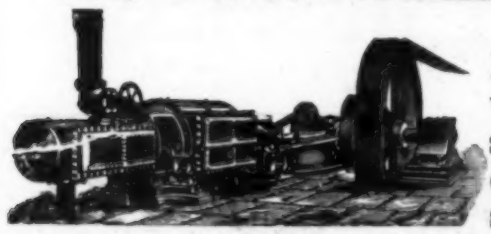
Shafting, Hangers, Pullevs.

Belt Elevators, Saw Mills.

WILLIAM TOD & CO.

YOUNGSTOWN, OHIO.

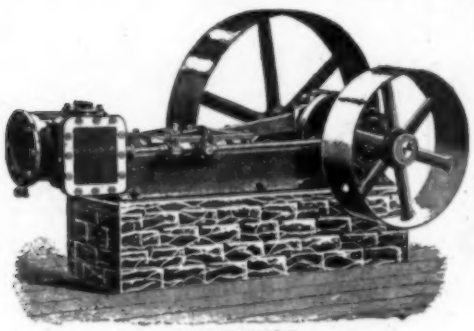
The Porter-Hamilton Engine



Reversing Engines, Blowing Engines, Converters, Hydraulic and special heavy machinery for the iron and steel trades.

Park Building, Pittsburg.

SEWARD S. BABBITT.



SENNETT ENGINE.

THE GEO. B. SENNETT CO.,

YOUNGSTOWN, OHIO.

MANUFACTURERS OF THE

Sennett Slide Valve Engine.

A well made and durable center crank engine of from 20 to 40 h. p. The design is thoroughly modern and all parts are made in duplicate Engines kept in stock ready to run. Catalogues or prices willingly furnished. Among our other specialties are the

Sennett Compressed Couplings.

(See advertisement next week.)

Foundry contracts solicited for Castings from 10 lbs. to 5 tons each.

The Iron Trade Review

Pays special attention to iron ore, blast furnace, rolling mill, foundry and machine shop interests. Per year $3.00.

6⅝ to 7¼	2.50 extra
¼ to ⅜	.10 "
⅜ to 11-16	.20 "
⅝ to 9-16	.30 "
7-16 to 15-32	.40 "
⅜ to 13-32	.50 "
5-16 to 1-32	.70 "
¼ to 9-32	.90 "
7-32	1.40 "
3-16	2.50 "

Flats.—Bar Iron.

1⅛ to 4 x ⅜ to 1	1.05 Base
4½ o 6 x ⅜ to 1	.10 extra
6¼ o 8 x ⅜ to 1	.60 "
8¼ o 10 x ⅜ to 1	.80 "
1⅜ o 4 x 1 1-16 to 1⅜	.30 "
4½ to 6 x 1 1-16 to 1⅜	.40 "
6¼ to 8 x 1 1-16 to 1⅜	.60 "
8¼ to 10 x 1 1-16 to 1⅜	.90 "
2 to 4 x 1⅜ to 2	.30 "
4½ to 6 x 1⅜ to 2	.60 "
6¼ to 8 x 1⅜ to 2	.80 "
8¼ to 10 x 1⅜ to 2	1.00 "
2 to 4 x 2⅛ to 3	.60 "
4½ to 6 x 2⅛ to 3	.80 "
6¼ to 8 x 2⅛ to 3	1.00 "
1⅜ to 1⅜ x ⅜ to 1	.10 "
1 to 1 1-16 x ⅜ to ⅞	.20 "
⅝ to 15-16 x ⅜ to ⅞	.40 "
⅝ to 11-16 x ⅜ to ⅞	.50 "
¼ to 9-16 x ⅜ to ⅝	.90 "

Heavy Band Iron.

7 to 10 x ¼ to 5-16	.70 extra.
6¼ to 6¾ x ¼ to 5-16	.50 "
4½ to 6 x ¼ to 5-16	.30 "
1⅜ to 4 x ¼ to 5-16	.20 "
1 to 1⅜ x ¼ to 5-16	.30 "
⅝ to 15-16 x ¼ to 5-16	.50 "
⅝ to 11-16 x ¼ to 5-16	.80 "
⅜ to 9-16 x ¼ to 5-16	1.00 "
⅜ to 7-16 x ¼ to 5-16	1.50 "

Heavy bands, 7-32 in. thick 1-10 c. per lb. higher than ¼ to 5-16 thick. Bevel Edge Shaft Iron 1-10 higher than same size of Heavy Bands.

Light Band Iron.

7 to 8 x No. 9 to 3-16	.90 extra
7 to 8 x Nos. 10, 11 and 12	1.00 "
6¼ to 6¾ x No. 9 to 3-16	.70 "
6¼ to 6¾ x Nos. 10, 11 and 12	.80 "
4½ to 6 x No. 9 to 3-16	.50 "
4½ to 6 x Nos. 10, 11 and 12	.60 "
1⅜ to 4 x No. 9 to 3-16	.40 "
1⅜ to 4 x Nos. 10, 11 and 12	.50 "
1 to 1 3-16 x No. 9 to 3-16	.30 "
1 to 1 3-16 x Nos. 10, 11 and 12	.40 "
13-16 to ⅞ x No. 9 to 3-16	.60 "
13-16 to ⅞ x Nos. 10, 11 and 12	.70 "
11-16 to ¾ x No. 9 to 3-16	.80 "
11-16 to ¾ x Nos. 10, 11 and 12	.90 "
9-16 to ⅝ x No. 9 to 3-16	1.00 "
9-16 to ⅝ x Nos. 10, 11 and 12	1.10 "
7-16 to ½ x No. 9 to 3-16	1.30 "
7-16 to ½ x Nos. 10, 11 and 12	1.40 "
⅜ x No. 9 to 3-16	1.50 "
⅜ x Nos. 10, 11 and 12	1.60 "

Bevel Edge Box Iron.

Same as Light Bands, of same sizes.

Beaded Band Iron, 1¼ in. to 2 in.

Sand Band Iron, 1-10 c. above same sizes of Light Bands.

Oval Iron.

⅜ to 1¼	.40 extra
¾ to 13-16	.50 "
⅝ to 11-16	.60 "
½ to 9-16	.80 "
⅜ to 7-16	1.10 "
½ to 9-16 x 3-16	1.00 "
⅝ to 11-16 x ¼	1.20 "

Half Oval and Half Round.

2¼ to 3	.60 extra
⅞ to 2	.50 "
¾ to 13-16	.70 "
⅝ to 11-16	.90 "
½ to 9-16	1.20 "
⅜ to 7-16	2.50 "
5-16	3.50 "
¼	4.50 "

Half Ovals less than ¼ their width in thickness extra price.

Horse Shoe Iron.

All sizes 1 c. extra.

Cutting ordinary bars to specified length, .20 to .30 extra, according to length and size.

Steel Bands.

Width In Inches.	English Standard Gauge.		
1 1-2 to 6,	Nos. 7, 8, 9 or 3-16"	1.50	Base.
			Extras.
1¼ to 6,	" 10, 11, 12 or 14"	.05	per 100 lbs.
1 to 1¼,	" 7, 8, 9 or 3-16"	.10	"
1 to 1¼,	" 10, 11, 12 or 14"	.15	"
13-16 and ⅞,	" 7, 8, 9 or 3-16"	.20	"
13-16 and ⅞,	" 10, 11, 12 or 14"	.25	"
11-16 and ¾,	" 7, 8, 9 or 3-16"	.30	"
11-16 and ¾,	" 10, 11, 12 or 14"	.35	"
9-16 and ⅝,	" 7, 8, 9 or 3-16"	.40	"
9-16 and ⅝,	" 10, 11, 12 or 14"	.45	"
¼,	Nos. 7, 8, 9 or 3-16"	.55	"
⅜,	" 10, 11, 12 or 14"	.60	"
7-16	" 7, 8, 9 or 3-16"	.75	"
7-19	" 10, 11, 12 or 14"	.85	"
⅜,	" 7, 8, 9 or 3-16"	.85	"
⅜,	" 10, 11, 12 or 14"	1.05	"

Iron and Steel Hoops.

Width Inches.	English Standard Gauge.		
7-16 to 3	Nos. 13, 14, 15 and 16	1.60	Base
			Extras.
7-16 to 2,	" 17, 18, and 19	.05	per 100 lbs
7-16 to 2,	" 20	.10	"
7-16 to 2,	" 21	.15	"
7-16 to 1¼,	" 22	.25	"
⅝ to 1¼,	" 13, 14 and 15	.05	"
⅝ to 1¼,	" 16, 17 and 18	.10	"

The Playford Mechanical Stoker

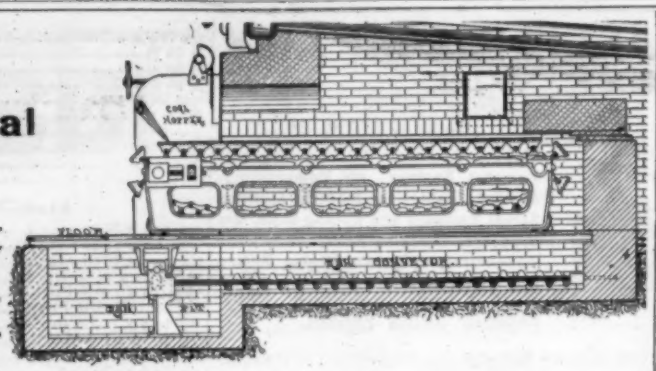
Guaranteed to Abolish smoke, to increase boiler capacity and to save fuel.

For information, address,

The Playford Stoker Co.

404 Telephone Bldg.,

CLEVELAND, OHIO.



IRON CLAD PAINT CO.

Factory, 75 & 77 Central Way. Sec. & Treas., No. 3 Case Build'g.

CLEVELAND, OHIO.

ORDER DIRECT FROM THE

Iron Clad Paint Co.

And get the genuine article, and save liability of suit for using an article made in violation of the patents issued to Wm. Green, and now owned by this Company.

IRON CLAD PAINT is the most durable, most fire-proof and Cheapest Paint made.

FURNISHED both Dry and Ground in Oil

USED BY NEARLY ALL THE RAILROADS.

COMPARE WEIGHTS

WHEN YOU ARE TOLD THAT JENKINS '96 IS MORE EXPENSIVE THAN OTHER PACKINGS.

Average weight, ¼" "Jenkins '96." 11 lbs. to the square yard.
" " ¼" Red Packing, 14 " " " " "

At 50c. per pound "JENKINS '96" is not only very much cheaper, but the best joint packing manufactured.

JENKINS BROS., New York, Boston, Philadelphia, Chicago

Dixon's Pure Flake Graphite

Is a Blessing to Every Engine Room and Machine Shop.

A small quantity added to any Oil or Grease largely increases its lubricating value and makes the finest Cooling Mixture.

Pamphlet and Sample Sent Free.

JOS. DIXON CRUCIBLE CO., Jersey City, N. J.

FOR GREAT TENSILE STRENGTH, ELASTICITY AND ELONGATION, COUPLED WITH UNUSUAL NON-CORROSIVE QUALITIES,

Castings and Propeller Wheels

MADE FROM

PARSONS MANGANESE BRONZE

CANNOT BE EXCELLED. WRITE FOR PARTICULARS.

SOLE MAKERS.

THE WILLIAM CRAMP & SONS

Ship and Engine Building Company,

PHILADELPHIA, PA.

A paper that is paid for and read—THE IRON TRADE REVIEW.

1¼ to 1¾,	"	19 and 20	1.07	100 lbs.
1¼ to 1¾,	"	21	.20	"
1¼ to 1¾,	"	22	.30	"
15-16 and 1,	"	13, 14 and 15		"
15-16 and 1,	"	16, 17 and 18	.15	"
15-16 and 1,	"	19 and 20	.20	"
15-16 and 1,	"	21	.25	"
15-16 and 1,	"	22	.35	"
⅞,	Nos. 13, 14 and 15		.20	"
⅞,	" 16, 17 and 18		.25	"
⅞,	" 19 and 20		.30	"
⅞,	" 21		.35	"
⅞,	" 22		.45	"
¾ and 13-16	Nos. 13, 14 and 15		.30	"
¾ and 13-16	" 16, 17 and 18		.35	"
¾ and 13-16	" 19 and 20		.40	"
¾ and 13-16	" 21		.45	"
¾ and 13-16	" 22		.50	"
¾ and 13-16	" 23		.60	"
11-16,	Nos. 13, 14 and 15		.35	"
11-16,	" 16, 17 and 18		.40	"
11-16,	" 19 and 20		.50	"
11-16,	" 21		.60	"
11-16,	" 22		.70	"
11-16,	" 23		.80	"
⅝,	Nos. 13, 14 and 15		.40	"
⅝,	" 16, 17 and 18		.45	"
⅝,	" 19 and 20		.55	"
⅝,	" 21		.65	"
⅝,	" 22		.75	"
⅝,	" 23		.85	"
9-16,	" 13, 14 and 15		.45	"
9-16,	" 16, 17 and 18		.50	
9-16,	" 19 and 20		.60	
9-16,	" 21		.70	
9-16,	" 22		.80	
9-16,	" 23		.90	
½,	" 13, 14 and 15		.55	
½,	" 16, 17 and 18		.60	
½,	" 19 and 20		.70	
½,	" 21		.80	
½,	" 22		.90	"
½,	" 23		1.00	"
7-16,	" 13, 14 and 15		.80	"
7-16,	" 16, 17 and 18		.90	"
7-16,	" 19 and 20		1.00	"
3/8,	" 13, 14 and 15		1.00	"
3/8,	" 16, 17 and 18		1.10	"
3/8,	" 19 and 20		1.20	"

Sheet Iron.

No. 10	2 35
No. 12	2 35
No. 14	2 45
No. 15-17	2 50
No. 18	2 65
No. 20	2 80
No. 22-24	2 80
No. 25-26	3 00
No. 27	3 20

Steel Boiler Plates—1-4 in. and Heavier.

Tank	2 50
Shell	2 60
Flange	2 75
Marine Flange	3 00
Fire Box	3¼

Above includes plates 90 inches wide.

90 to 96 in. wide	1c. lb. extra
96 to 100 in. wide	1½c. "
100 to 104 in. wide	3c. "
104 to 106 in. wide	special

Wrought Pipe and Boiler Tubes.

Merchant pipe, from store		dis. 50 and	10
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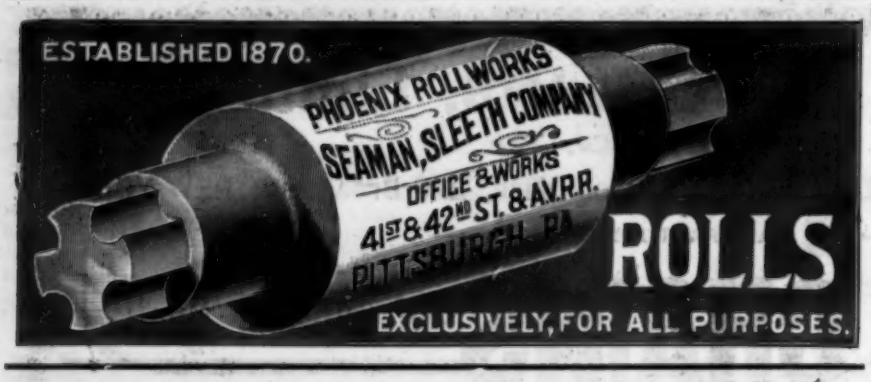

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No. 35	Ind. & St. Louis Express	*12:00 m
No. 27.	Columbus Accom	4:00 pm
No. 37,	Col., Cin. Express	*8:30 pm
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No. 28,	Cin. & Col. Express	*6.45 am
Fo. 26,	Calion Accommodation	9:45 am
No. 36,	Indianapolis & St. L. Ex	*2:30 pm
No: 46,	Columbus & Cin. Express	*2:55 pm
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Time Table effective May 15th, 1898.
Cleveland Depot: Foot of South Water Street.
Elyria Depot: Huron St., West Side.

South Bound.			Central Standard. Lorain Branch	North Bound.		
15	13	11		12	14	16
P.M.	P.M.	A.M.	LV. AR.	A.M.	A.M.	P.M.
4:25	2:25	6:27	Lorain	9:15	11:35	7:30
4:40	2:30	6:44	Elyria	9:00	11:21	7:16
4:56	2:55	7:04	Grafton	8:43	11:07	6:58
5:15	3:12	7:23	Lester	8:25	10:50	6:40
5	3	1	Main Line	2	4	6
5:30	2:25	7:20	Cleveland	8:30	11:50	7:15
5:47	2:41	7:36	Brooklyn	8:14	11:34	7:01
6:42	3:26	8:22	Lester	7:29	10:49	6:19
6:52	3:35	8:30	Medina	7:16	10:37	6:07
7:05	3:46	8:41	Chippewa La	7:04	10:26	5:55
7:20	4:01	8:56	Sterling	6:48	10:12	5:40
8:09	4:46	9:45	Massillon	6:00	9:23	4:54
8:55	5:31	10:34	Canal Dover.	5:11	8:36	4:10
9:02	5:38	10:41	New Philade	5:04	8:28	4:03
9:20	6:05	11:25	Uhrichsville	4:45	8:10	3:45
.....	8:10	1:30	Bridgeport	6:05	1:40	
.....	8:25	.....	Bellaire	5:50	.....	
P.M.	P.M.	P.M.	AR. LV.	A.M.	A.M.	P.M.

No. 9 leaves Lorain 9:50 a.m., Elyria 10:05, Grafton 10:21; arrives Lester Junction 10:40. No. 10 leaves Lester Junction 3:25 p.m., Grafton 3:42, Elyria 3:57; arrive Lorain at 4:10 p.m.

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Valley Jctn. & Way Stations	*6:25 P M	*7:25 A M
Wheeling & Chicago	*9:25 P M	†7:25 A M
Akron, Canton & Chicago	*8:05 A M	*10:00 P M
Akron, Canton & Wheeling	*10:20 A M	*3:30 P M
Akron, Canton & Chicago	*8.05 A M	*6:35 P M
Akron, Canton & Marietta	†2:10 P M	†11:00 A M
Pittsburg, Washington, D. C., & Baltimore	*10:30 A M	*3:25 P M

†Daily except Sunday. *Daily. Pullman's Palace Vestibule sleeping cars between Cleveland and Chicago, also Washington, Balto and Philadelphia.

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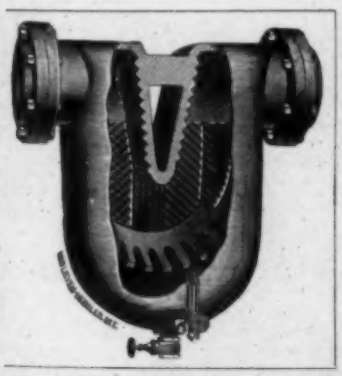

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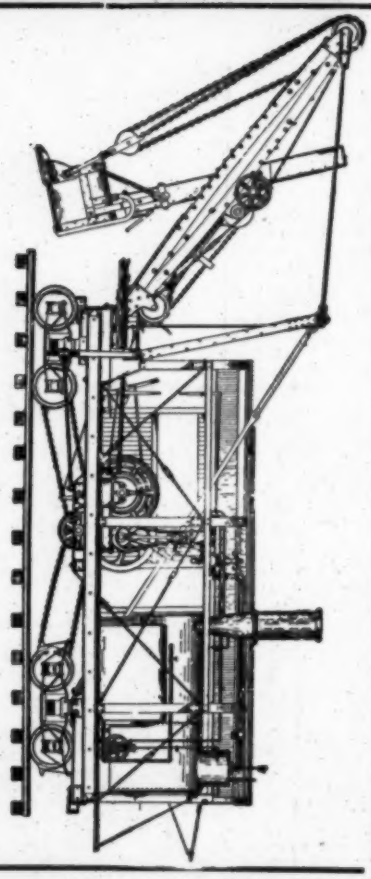

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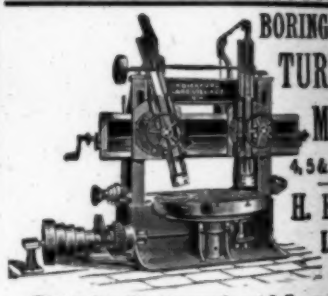

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